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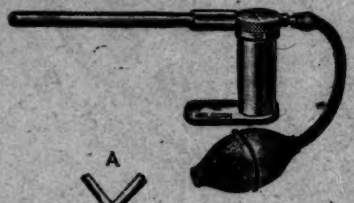

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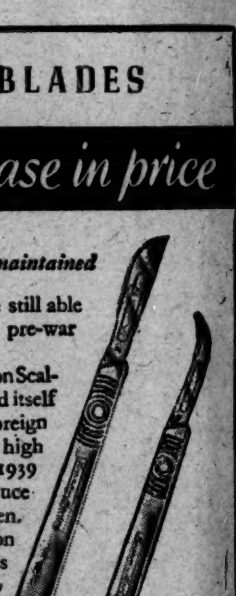

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BRITISH MEDICAL JOURNAL

LONDON SATURDAY MAY 26 1945

THE INTEGRATION OF MEDICINE*

BY

F. M. R. WALSHE, M.D., D.Sc., F.R.C.P.

In the course of discussions upon the future and development of medicine two themes recur with melancholy iteration—namely, that specialism is an evil, and that it is inevitable. For this dilemma in which it seems generally agreed that we find ourselves no one proposes a remedy, or lights the path we must follow if we are to discover one. In his Harveian Oration of 1931, before the Royal College of Physicians, Sir Robert Hutchison spoke with insight into our situation when he said, "Specialism is inevitable; but though favourable to the accumulation of facts, it is bad for the philosophy of knowledge. There is too little speculation and too little use of the imagination; and most scientific literature is barren in ideas." Therein he put his finger upon a malady of modern science.

Yet whether the remedy the Harveian orator proposed is one we can adopt is open to question, for he went on to say that "it might be a good thing if there were a close time in laboratory work, say for five years, to enable us to digest the vast accumulation of knowledge we already possess and to think out new lines of advance." Yet I doubt if in the present climate of opinion, five years of research inactivity would increase interest in the use of the intellect, while, on the other hand, if we could stimulate this interest, a five-year truce with facts would be neither necessary nor desirable. The average modern scientific worker, paradoxical as the suggestion may seem, is more apt to be a man of action than of thought. He tends to distrust ideas. He has not always learned to achieve a harmony of observation and of general thought. His output of facts is necessarily reduced if he pauses to think about them. It may then easily be said of him that he is not making "discoveries" as fast as he should. In any case we cannot dam the stream of research effort, even if we do see too much of it losing itself in the sands.

It is significant that it is in medicine, and not in its so-called ancillary sciences where the situation is not essentially different, that an acute consciousness of the dilemma I am considering should first have dawned. Reasons for this are easily found. Let us take the case of physiology as example. This is now busily exploiting the harvest of technological advances in all fields of science, and is adapting to the solution of its own problems the methods which these sciences—physics, chemistry, and biochemistry—are so richly providing.

It has thus come about that a given physiological problem, such as the nature of cerebral cortical function, may now be approached from so many angles that it assumes the appearances of, and is too readily taken to be, many disparate and unrelated problems. All effective communication in thought tends to be broken between the users of the different exploratory techniques, and information accumulates while generalization wilts and dies. To use an expression familiar to readers of war reports, the physiologists are "fanning out" into the unknown, and in this active stage of their advance fail adequately to realize that co-ordination of thought and aim must be retained if physiology is to be a coherent body of knowledge. Let me take again, as an example, the problem of localization of function in the cerebral cortex. Over fifty years ago Hughlings Jackson, the clinician who discovered the *fact* of localization of function within the cortex, being a man of ideas, also made some penetrating generalizations as to the *nature* of this localization. The era of experimental study of this problem opened very shortly afterwards, and has since been pursued with ingenuity, with eagerness, and by an increasing number and variety of techniques—the most modern ones being of great refinement and delicacy. Yet there has been no comparable development of thought upon the subject, and a crude notion that sees in the cerebral cortex a mosaic of sharply delimited localizations of fragments of function has survived virtually unaltered since the pioneer experimental investigators first bent their energies to the task of discovery. During all this time Jackson's interpretation and synthesis of the facts have scarcely influenced thought. It is not that this interpretation has failed to generalize the facts, it is simply that it has largely failed to excite the interest of research workers. The taint of ideas that clung to it, and the bend sinister of its clinical pedigree, have together provided the experimentalist with an excuse not to think about it.

Nor is this preoccupation with the collection of information the only factor in the disorderly state of knowledge on this and allied subjects. As Trotter has pointed out, and abundantly exemplified, in more than one of his penetrating addresses, physiologists commonly, and naturally enough, pursue their science for its own sake. Theirs is therefore by definition a liberal profession, while that of a physician is a useful one. I make this distinction in no invidious sense, but in the sense employed by Newman in his lectures on "The Scope and Nature of University Education," where he says, "That alone is liberal knowledge which stands on its own pretensions, which is independent of sequel, expects no complement, refuses to be informed (as it is called) by any end, or absorbed into any art in order duly to present itself to our contemplation." This quality, which physiology as a branch of liberal knowledge shares with such physical pursuits as cricket and fox-hunting—as Newman also points out—is not shared by medicine, whose activities have an end other than themselves: namely, the health and well-being of the community.

I do not wish to be taken as implying that the fruits of physiological research are not useful—indeed, we know that they are not rarely potent weapons in our hands—but as emphasizing that this last result is, when it happens, fortuitous, and is not one that the physiologist as such intends or is interested in. In short, in medicine we have to apply our knowledge, however garnered, to well-defined ends, to the prevention and cure of

* Being an abridgment of the Annual Oration of the Medical Society of London, May, 1945.

illness and, as a corollary to this, to the training of the doctors of the future. It is this that brings home to us, whether we will or not, the dangers inherent in the unceasing expansion and differentiation of the field of knowledge. As has been aptly said, once we seek to go beyond the basic elements of medicine as we know it, we tend to know more and more of less and less. Thus it happens that those responsible for the training of our successors too often find themselves imparting unrelated categories of information and partial and often conflicting generalizations culled from different fields of medicine, and it is becoming nobody's business, and seems less and less within anyone's capacity, to teach medicine as a whole, or to build into a coherent body of knowledge the several contributions of the specialists.

It is therefore because ours is a useful rather than a liberal profession that we have been forced to face the situation created by the accumulation around us of more, and more diverse, information than we can digest and assimilate. Hughlings Jackson was clearly aware of this, over 50 years ago, when he said that "we have multitudes of facts, but we require, as they accumulate, organizations of them into higher knowledge; we require generalizations and working hypotheses. The man who puts two old facts into new and more realistic order deserves praise as certainly as does the man who discovers a new one. There is an originality of method." But in this, as in much else, Jackson was before his own time and ours; and thus it is that physiology, true to its nature as a branch of liberal knowledge, sees no reason why it should not continue to browse at will upon the rich pastures of uncropped knowledge, giving no thought to any philosophy of knowledge, while medicine, faced by its ultimate purpose, has clamant responsibilities in the ordering of the knowledge at her disposal, and in the maintenance of a balance of activity and thought, that she dare not continue to evade. Medicine, then, has come to see that the unending additions to knowledge call urgently for a corresponding measure of integration. Yet we must try to strike a fair balance in this matter. Let it not be thought that I am making odious comparisons between physiologist and physician. We are both in the same boat, and in medicine we need not flatter ourselves that it is primarily out of any intellectual disquiet, or out of a divine discontent with the chaos of information that lies around us, that we have been brought to realize our dilemma—namely, the necessity and the evil of specialization. We are as innocent of any philosophy of knowledge as the physiologist. Our concern arises because much that is implied in the term "specialism" has come to be an obstacle to the teaching and practice of medicine.

Nevertheless, by whatever channel this awareness of the disorderly state of our science has reached us, we are at least generally agreed that we cannot indefinitely go on as we are, and that something must be done to bind the broken foundations of medicine and to make it something more than a congeries of ingenious techniques and unrelated fragments of knowledge. This, at any rate, however gained, is something gained.

Integration Keeps Pace with Differentiation

The thought that I am trying to develop will be familiar to many of you. It is summed up in the aphorism so familiar to neurophysiologists, "Integration keeps pace with differentiation." This is a fundamental principle in the evolution of the nervous system, and I cite it because I believe it to have a vital meaning for us in my present connexion. We owe its original formulation to the now disregarded genius of Herbert Spencer, from whom it was taken and so fruitfully employed by Hughlings Jackson. Derived anew from this latter source, it became a guiding inspiration in Sherrington's monumental contributions to experimental physiology, and its influence may be seen in the title he gave to his classic work of 1906, *The Integrative Action of the Nervous System.* Yet it is not so much with integrative action of the nervous system in respect of the organism as a whole that I am now concerned as with the development within that system, as it becomes progressively more differentiated, of structures and functions designed to control and to unify the several parts and to make them into a harmonious whole. In short, integration does, as an observed fact, keep pace with differentiation in the evolution of that system.

This conception is capable of a wider meaning than that given to it by the physiologist. I submit that it expresses something inherent in scientific thought and constantly found in truly scientific endeavour.

Let us now replace the term "differentiation" by "observation" and the term "integration" by "interpretation and synthesis." Observation leads to the increase and differentiation of information, while interpretation and synthesis are its integration into ordered knowledge, and I suggest that in the process of scientific thinking interpretation and synthesis must keep pace with observation if a coherent body of knowledge is to be forged. From this we pass easily and naturally to the notion that there is a rhythm in scientific thought, the two elements observation and interpretation alternating.

The feeling that there is such a natural rhythm in thought, a cycle in which observation and interpretation alternate, is widely implicit in our literature in respect of all branches of knowledge. It finds expression in such a statement as that of Lord Acton, "The main thing to learn is not the art of accumulating material, but the sublimer art of investigating it." While in Matthew Arnold's essay on *The Function of Criticism* we read, "The grand work of literary genius is a work of synthesis and exposition, not of analysis and discovery." Coming to our own field, we find Abraham Flexner writing: "Data of one kind or another are not so difficult to obtain; but generalization is another matter. . . . The two processes—the making of hypotheses and the gathering of data—must go on together, reacting upon each other." But the notion gets its fullest and most explicit formulation in a passage from the first volume of Arnold Toynbee's *Study of History,* which I have already quoted elsewhere, and do so again, to reinforce the cogency of my theme with the authority of this erudite thinker on history. He says:

"Scholarship makes its progress by a rhythmic alternation between the two activities—the collection of materials and their arrangement, the finding of facts and their interpretation—just as a physical organism lives and grows by an alternation between eating and digestion. The old fable of the belly and the members points the moral that neither activity is superior or inferior, prior or posterior, primary or parasitic, but that each is inseparable from the other as a part of the same whole, and complementary to the other as a phase in the same recurrent process. For the alternation perpetually recurs in virtue of the very nature of thought. When the mind is employed in finding facts, its sheer success inhibits it sooner or later from fact-finding uninterruptedly and *ad infinitum*. Sooner or later it finds itself so formidably beleaguered by the mass of facts which it has gathered round it that, until it has sorted them out and arranged them in some kind of order, it can no longer sally out into the Universe to gather more. Then the mind changes its activity perforce and employs itself for a season in making syntheses and interpretations. Yet now, once again, its sheer success inhibits it from working uninterruptedly and *ad infinitum* at bringing order out of chaos. Sooner or later, it finds that it has reduced to order all those materials which it had collected in its last fact-finding reconnaissance. Fresh facts must now be found before the process of synthesis and interpretation can be carried further. . . . No collection of facts is ever complete, and no synthesis or interpretation ever final. . . . This rhythm is native to thought in all its different channels. In the channel of Physical Science, we have seen that thought has recently passed out of a fact-finding phase into the next phase of synthesis and interpretation."

Thus Toynbee, and, *mutatis mutandis,* what he has to say of the study of history applies to medicine and the sciences ancillary thereto. In a remarkable foreword to his book on anaphylaxis and immunity, Maurice Arthus, with a true French fire and clarity, tells us how this balance is to be achieved, and how vital to science it is. This foreword has recently been translated into English under the title of *The Philosophy of Scientific Investigation* by Sigerist, and published by the Johns Hopkins Press. He says:

"The experimentalist must ponder and meditate deeply over the problems raised. . . . In order to make some progress in the experimental sciences one must meditate a great deal. I have repeatedly mentioned," he goes on, "the necessity of controlling the facts observed, of discussing the interpretations proposed and the meaning attributed to them, in order to accept as true and valid only what has stood the indispensable test of scientific criticism. This presupposes a special mental attitude which, unfortunately, is hardly developed in the schools, colleges, or perhaps even in the universities—namely, critical sense. This is the tendency of the mind to seek the true value of facts and results, of methods and of concepts,

It should not be necessary for me to labour this point any more, yet I believe that few would contend that during our time either medicine or its ancillary sciences have consistently honoured these principles of scientific thought, or have conformed to this rhythm of which Toynbee speaks as "native to thought in all its different channels." We have in fact, with some brilliant exceptions, been far too readily satisfied with fact-finding, and too little regardful of those intellectual instruments by which facts are interpreted and generalized. The work of Hughlings Jackson was such an exception, and another that stands out in my mind is that of Sherrington in the field of physiology. I can yet recall the feeling of exaltation with which, as a student of physiology over thirty years ago, I first read his *Integrative Action*. Here were new facts of observation in rich abundance, and how beautifully co-ordinated! With what logical precision the exposition of them advanced from step to step, and with what penetrating scientific imagination was their significance revealed! This perfect rhythm of observation, interpretation, and synthesis, which is the hall-mark of scientific genius, has characterized all Sherrington's work and has made of it a unified whole, a brilliant chapter in the story of the nervous system.

In the clinical field we see the same brilliant qualities informing the studies of Trotter and Davies on cutaneous sensibility. Here, within the brief scope of two papers, we find as complete a harmony of observation and interpretation and as finished a piece of medical research as modern medicine has to show. A comparable trend is seen in Head's work on sensation, a rhythm of observation and interpretation and a continuity of thought over a long-sustained research; and if the observations in some details have since proved fallacious and the interpretation sometimes unduly abstract, the whole is an impressive example of the normal rhythm of scientific thought with its own elements of grandeur.

To sum up this stage of my thesis, therefore, we see that as new facts increase in number and diversity, the need for their interpretation and synthesis increases in corresponding degree. By these means we forge those general principles that keep knowledge coherent, and make of it truly scientific knowledge.

One is sometimes asked what, precisely, one refers to by principles of medicine, and I admit that the term is apt to be used without due definition. Let me tax your patience by yet another example from the field of neurology. The generalizing mind of Hughlings Jackson, surveying the wide range of phenomena of disease of the nervous system, discerned that the totality of these phenomena could be subsumed under four headings, that the functions of the nervous system could react to damage in but four essentially different ways, whatever the aetiology of the pathological process concerned. He thus was able to formulate four corresponding generalizations. He then went further, and, taking the phenomena of nervous disease as a whole, he saw that these constituted an orderly reversal of the natural evolution of function in the nervous system, whether considered phylogenetically or ontogenetically. He was thereupon able to formulate a further and wider generalization—namely, a general principle of dissolution of function in the nervous system. Although seventy years have elapsed since this was expounded—years rich in new knowledge of relevance to the problem—it still provides a generalization of wide validity and great usefulness. Thus, however discouraging the therapist may find diseases of the nervous system, we have in neurology a coherent body of knowledge more closely based upon anatomy and physiology than any other branch of medicine, saving only cardiology, which has a body of general principles of a like order. Such a consummation should be our aim over the whole field of medicine.

No one will deny that there are dangers inherent in the use of generalizations—for example, the tendency to fit the new facts into the procrustean bed of theory, where knowledge may become rigid and die. Abstract thinking has indeed been described as "a major vice of the intellect," and no one has spoken more cogently of its dangers than Trotter. Nevertheless, he has also told us that ideas keep science fresh and living, and when properly used are in no danger of ceasing to become the nimble servants of truth. Therefore, even though the intellectual instruments of abstract thought and generalization may turn in our hands, we must yet use them if we are to advance.

Now, those of you who may be ready to accept the point of view I am trying to advance may still ask me how we are to apply it. How are we to reduce the vast accumulation of facts to some sort of order, to elicit general principles, and to build a coherent science and art of medicine? From the very nature of things we shall never achieve finality, but at least we can try to tidy up as we go along.

I believe, in brief, that we must be imbued with a vivid realization of the fact that scientific thought and activity make up a rhythm of which observation on the one hand, and synthesis and interpretation on the other, are the elements, and that the mere eliciting and recording of factual details is by itself not science, and does not become so until the cycle is complete. In other words, we need a wholesome respect for ideas as an integral part of scientific thought. I cannot help thinking that if in every centre of original work, clinical and laboratory, workers were constantly aware of the principle that integration of knowledge should keep pace with its differentiation, we should find many fewer disjointed and apparently purposeless observations swelling the monstrous bulk of scientific literature. I sometimes doubt whether one is justified in recording in print a new observation unless one also seeks to indicate what it holds, and to apply the inductive process to it. One should not fling a raw fact on to paper in public, as a keeper flings a chunk of raw meat to a tiger. I believe that in medicine we have a unique advantage in this respect over the purely experimental scientist, in that medicine, while becoming increasingly an experimental, has long been and must continue largely to be an observational science. In its observational aspect it deals with a supremely difficult material under conditions that make constant demands upon intuition and judgment. Nature is not interested in scientific method, and the experiments she provides for us in the guise of disease and injury we have to take as we find them; we cannot subject them to the necessary but artificial simplification that is the essence of a good experiment. We are therefore forced to think, to synthesize, and to interpret our evidence to a point rarely necessary in the designed laboratory experiment. While, therefore, we must welcome the increasing role of experiment in the study of medicine, we must be on our guard not to be infected by the distrust of ideas characteristic of much experimental work, but continue to use the intellectual assets which experience of clinical observation gives every good doctor.

I confess that I have inflicted many quotations upon you, a fault which one filling the role of orator should never commit, but my object in doing so is to emphasize, as clearly as I am able, that my thesis is no new one, no private bee buzzing in my bonnet, but one that has often been maintained and exemplified by those whose labours in the realms of observation and ideas have shone most brightly before us.

Tasks Involved in Rebuilding of Medicine

If you have followed me so far, you will probably agree that there is one simple way in which each of us can contribute to the integration of medicine—by seeing that in any addition we may be able to make to the sum of medical knowledge we tidy up as we go along and conform to the natural rhythm of scientific thought, and that we try to build our fragmentary contribution into the general body of relevant knowledge.

A second task involved in the rebuilding of medicine is to ensure, as and when the human resources are available, that those who hold key positions in centres of medical education and research shall be men interested not only in research and routine teaching but also in general ideas.

This may prove no easy task, for such men are rare, and the trend of values hitherto has not been such as to encourage them to follow their bent. You cannot find them by offering professorships, as some suppose, but you can always offer them full opportunities when you find the men. Encouragement must begin when they are young, and before they become moulded or resigned to the ephemeral patterns of current orthodoxy. The young worker must be allowed to retain his

intellectual independence and to pursue the problems he has found for himself—as the best men do find them for themselves; he must also be allowed some vestige of freedom by the editors of those scientific journals in which his work reaches the world, in developing his ideas, so that his papers are not reduced by the editorial blue pencil to those drab sequences of experimental protocols that for too many appear the ideal of a scientific paper. An editor should be "no envious Juno sitting cross-legged over the nativity of any man's intellectual offspring," as Milton says; and whoever believes that the censorship of ideas survives to-day only in the totalitarian State imagines a vain thing. The original sanctions may have gone and a censorship's formal existence have ceased, but the itch to suffocate the infant idea burns in us all in greater or less measure.

I may seem to have wandered far from my opening theme —namely, the evil and the necessity of specialism in medicine —but I believe that in fact I have not done so. The danger of specialism is not so much that a man devotes his major activity to a restricted field of knowledge in medicine, but that he is so apt to become absorbed in its details, and still more in those of the complex instruments that are now so freely at his disposal, that he unwittingly cuts adrift from the general body of medicine and goes off on a voyage of his own.

There are in truth no irrelevances and no contradictions in nature, nor can there be in any coherent body of knowledge. The specialist, therefore—and I use the term in its strict and not in its journalistic sense—must cling fast to the foundations of medicine, for only thus can he integrate his contributions to knowledge and orient them, and avoid the multiplication of those conflicting *ad hoc* hypotheses with which medical and allied literature are littered.

So, too, the teacher of medicine has a like obligation to interpret so far as possible and to keep a lively interest in general ideas. This applies with greater force to the academic than to the purely clinical teacher, who has a major responsibility in handing on the art and the techniques of medicine.

Last, there are our textbooks. It has now become the almost universal practice for a textbook of medicine to be the algebraical sum, if not often the integration, of the knowledge of a body of specialists. There is a danger inherent in this plan, forced upon us though it may be, for it demands in the editor of such a compilation gifts of detailed knowledge and of generalization that few can hope to possess. In these circumstances, also, an editor has to have a clear idea as to the circle of readers he is providing for, as to the particular want he desires to satisfy. What is best for the student is not necessarily adequate for the follower of higher studies, and what the latter requires is not the diet for the student. Too often we see an attempt made to make the best of both worlds, with the result that neither is wisely catered for. Of all textbooks it may not unfairly be said in our day that they are more interested in facts than in ideas, and an urgent task before us is some recasting of them. It is significant of the trend of current thought that whereas formerly textbooks of medicine claimed to expound the "principles and practice" of medicine, no modern work of the kind makes even a titular claim to concern itself with principles.

Finally, there is a pseudo-integration of medicine against which we are not always sufficiently on our guard. This is exemplified in the numerous doctrines of those who see their own specialty everywhere in medicine, who have their own touchstone by which all the phenomena of illness are to be assessed. They measure every man's corn by their own bushel, and are obsessed by this or that cult of ideas and are always proselytizing. They make up those cohorts of hobby-horse riders who cavort noisily to and fro across the field of medicine, throwing up little but dust into our eyes.

The Role of General Education

Now if this notion of what is requisite to advance in medicine has validity it must presuppose an adequate general education as a foundation. If those who come after us are to be equipped to observe and describe accurately and interpret logically and imaginatively, their training to these ends must begin while they are still young, and their school education should not be based upon short-sighted utilitarian considerations, or be of what I may call a polytechnic order, but should include as its very foundation a thorough training in the use of that noble instrument for the expression of thought and feeling, our mother tongue, in the expansion of that instrument by the right use of analogy, and in its logical employment.

In brief, what I am invoking are the three arts of grammar, rhetoric, and logic. If we lack a command of language we cannot hope to produce, formulate, or entertain general ideas or make even the simplest essays in abstract thinking.

Now, those who are familiar with the aims and methods of the mediaeval university will recall that these three arts, composing what was called the trivium, formed the basis of university education. It may perhaps be argued that in the Middle Ages, the ages of scholastic philosophy and of theological disputation, these three arts tended to be followed as an end in themselves, that the training in clear exposition and thought was what I have already called a liberal education with no end other than itself, and that it led to mere logic-chopping and to no advance in natural knowledge. Some of this may be true; I express no view upon it, and I am not proposing the revival of these arts merely as an entertaining and stimulating variety of mental gymnastics. I put them before you as an essential preliminary to that clarity of thought and expression that is one of the weapons of scientific advance, of the tools with which we pursue natural knowledge. From which it follows that the greater our command of language, the more clearly and deeply we can think and express our ideas. I submit, therefore, that a command of language, and its logical use, are vital preliminaries to any scientific training.

Some may ask me where rhetoric comes in. In its original and its mediaeval sense it refers to the expansion and condensation of discourse by analogy and figure of speech. Wherever we find lucid and vital English, there we find rhetoric. What a text of lovely and illuminating rhetoric are the psalms, for example. Rhetoric has its place in the expression of those ideas we derive from the study of facts, nor can we teach without it.

In short, what I am proposing is that a humane education is an invaluable asset to any youth embarking upon the study of medicine. I am aware that I raise the banner of a forsaken cause when I say this; but nevertheless, twenty-five years of clinical teaching have fully persuaded me that when I find a clinical clerk who can stand up and read at a ward visit a case history that is a well-ordered, lucid, and fluently expressed account of the patient and his situation, that student will almost invariably be found to have had a sound education, and not a mere course of instruction of the polytechnic order, a utility education. This is why we must all deplore the practice of turning boys over to premedical subjects exclusively, or almost exclusively, directly they jump the hurdle of the school certificate. Too often they come to us semi-articulate, their budding ideas imprisoned behind the bars of an inadequate command of expression. It is between the ages of 14 and 18 that the capacity for pursuing a line of thought and for abstract thinking develops, and it is then that the adolescent should find himself provided with the necessary instruments of speech. "Give me," says Milton, "the liberty to know, to utter, and to argue freely." If we changed this by saying "Give me the literacy to know, to utter, and to argue freely" we should not really be altering the sense, for it is the capacity to express it that gives liberty to thought.

Conclusion

What I have had to say is somewhat remote from the medicine that presents itself to us in our daily lives. Yet as we grow older the urge to lift our eyes from the details of the little plot in which each of us labours becomes ever stronger, and we are impelled to look round upon the wider field of natural knowledge as a whole. Some may even feel the pull towards some philosophy of knowledge, towards those common truths to which all science must be obedient. Man does not live by facts alone, but craves also for generalizations, and the desire for some philosophy of knowledge burns, if with varying intensity, in all of us.

Looked at in this spirit, how untidy and in places how overgrown the field of medicine seems to be; in other places how bare, how precariously balanced the whole upon the uncertain

foundations of biological knowledge! So it must remain until we develop a wider and deeper consciousness of what constitutes ordered knowledge, and by what cycle of thought it is to be achieved.

Yet to feel some discontent with medicine as we find it does not imply any lack of pride in its achievements, nor any diminished sense of privilege in seeking to serve it. If one is a critic, it is, I trust, in the spirit expressed by Milton when he says, "For he who freely magnifies what hath been nobly done, and fears not to declare as freely what might be done better, gives ye the best covenant of his fidelity."

ON THE DIFFERENCE BETWEEN THE SEXES IN DISPERSION OF INTELLIGENCE

BY

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It is a striking fact, though it is in no way surprising, that in mean performance on intelligence-test scales there should be no difference between boys and girls. On the other hand, and especially in view of this first result, it is one of the oddest facts in the whole field of human biology that boys should be more variable than girls. Furthermore, as will be shown, the difference is not merely a small one, considerable though the academic interest of this would be; it is a large difference with important practical implications. Gifted boys are more numerous than gifted girls, the discrepancy increasing as we pass further away from the average performance of the whole population; till, actually, the performance of the cleverest boy in each 1,000 boys is equalled by only one girl in each 2,000 girls; thus at this level highly intelligent boys are twice as numerous as girls. All this is, however, exactly counterbalanced at the other end of the scale, dull boys being more numerous than dull girls and very dull boys correspondingly much more numerous. In other words, girls tend to be grouped closer to the average for the whole population, while boys tend to spread further over into extremes of brightness or dullness. In the planning, therefore, of such things as the provision of facilities for higher education, a greater percentage allotment should be made for boys than for girls. Similarly, greater provision for boys is needed in special classes and schools for the backward and, to the extent that mental deficiency depends upon intellectual retardation, much more in institutions for mental defectives.

Existence of the Difference

The sex difference in dispersion of intelligence is an empirical observation: so far as I know, nothing analogous has been demonstrated, and it is difficult to think of any convincing biological explanation. In these circumstances it has been naturally and rightly felt that strong evidence should be forthcoming before so curious a finding should be accepted.

From the early days of accurate mental measurement indications of the difference began to appear, though by no means invariably in all studies. It is easy to see why results should have been conflicting. In the first place, relatively large numbers are required in order to detect a difference in variability—considerably larger than those required in order to detect a difference in means; from this point of view most samples were very small. In the second place—and this is much more important—it is very difficult to secure a random sample of intelligence-test results. Bias in the sampling of school-children tends especially to affect the extremes; hence the sex difference in dispersion is particularly liable to be artificially minimized. For example, my colleagues and I (Roberts, Norman, and Griffiths, 1935) have shown that the omission of private-school children from a complete group considerably diminished the difference. For these reasons, Winsor, writing as late as 1927, could still conclude, after a careful review of the literature, that the evidence was insufficient.

Not until the appearance of that magnificent piece of work, the survey carried out by the Scottish Council for Research in Education (1933), was all legitimate doubt at an end. In this survey both the difficulties mentioned above were admirably countered. The numbers tested were vast, being no fewer than 87,000; and every effort was made to secure completeness of sampling, the aim being to test a complete annual age group throughout the whole country. It is true that some unavoidable bias remained, but in excellence of sampling no less than in numbers this group was a great improvement on its predecessors.

A good verbal group-test was applied, the results being as follows:*

Difference in Mean Performance between Boys and Girls

	No.	Mean Score
Boys	44,210	34·506
Girls	43,288	34·411

Difference = 0·095 ± 0·105

The difference is less than its standard error, so that, even using such large numbers as these, it is impossible to decide whether boys or girls have the higher average performance.

The variances tell a very different story:

Difference in Variance between Boys and Girls

	No.	Variance
Boys	44,210	253·747
Girls	43,288	225·605

Difference = 28·142 ± 1·885

This very large difference is no less than 14.9 times its standard error.

The existence of the difference is abundantly demonstrated, but two important points must be considered: it is demonstrated using this particular test and for this particular sample; is there any reason to anticipate that using another scale or another sample the same result might not be obtained?

First, as regards the test, good scales designed to measure general intelligence correlate so highly with each other that it is, to say the least, extremely unlikely that the sex difference would not appear whichever was used. Direct proof, however, is not lacking. The Scottish investigators retested a sub-sample of 1,000, using the Stanford-Binet scale. A certain lack of randomness in the sampling complicates interpretation, but it was shown that the difference is clearly apparent on the Binet scale also.

My colleagues and I used a different verbal group-test, the advanced Otis, in our survey of school-children at Bath, as described in a series of papers (Roberts *et al.*, 1935, 1937, 1938a, 1938b; Roberts, 1940). Our results are as follows:

Difference in Mean Performance between Boys and Girls

	No.	Mean
Boys	1,742	100·743
Girls	1,606	99·790

Difference = 0·953 ± 1·187

Difference in Variance between Boys and Girls

	No.	Variance
Boys	1,742	1296·38
Girls	1,606	1066·26

Difference = 230·12 ± 53·75

Just as in the Scottish survey, there is no significant difference in mean performance but a very large difference in variability, this being 4.3 times its standard error.

As regards the sampling, it has already been mentioned that the Scottish group was carefully selected; such bias as there was could not affect the magnitude of the difference materially, and in any event would tend to diminish and not to increase it. The Bath group is, of course, much smaller, but even greater care was taken to ensure completeness. The aim was to ascertain and test every child whose time of birth fell between certain dates, and whose home was within the boundaries of the city on a given date. As described in the papers quoted, this aim was very nearly attained.

It can be safely concluded, therefore, that any good test of general intelligence applied to any good sample will show the

* All calculations in this paper on the Scottish survey results are based on the tables given on pages 61 and 62.

difference in dispersion between the sexes; boys and girls do not differ in mean performance, but boys are quite certainly more variable.

Size of the Difference

The reality of the difference between the sexes has been demonstrated, but the available information permits us to take the further step of making a useful estimate of its magnitude. How much more variable are boys than girls? The ratio of the variances in the Scottish survey is (using Sheppard's adjustment for grouping) 245.414/217.272=1.130. Boys are therefore 13% more variable than girls.

The numbers included are large enough to provide a high degree of accuracy of estimation. The odds are 1 in 20 that the true value lies outside the range 11.2 to 14.7%; they are 1 in 100 that the true value lies outside the range 10.7 to 15.2%. These limits are, however, once again subject to the provisos: on this test and in this sample.

In the Bath experiment the ratio of the variances is 1294.30/1064.18=1.216. Boys are thus 21.6% more variable than girls; but as the numbers are smaller than those of the Scottish survey the limits of error are much wider. The odds are 1 in 20 that the true value lies outside the range 11.7 to 31.5%, and 1 in 100 that it lies outside the range 8.6 to 34.6%. The results of the two surveys do not conflict significantly.

There are several factors which point to the conclusion that the Scottish figure is somewhat too low.

1. *Errors of Measurement.*—Verbal intelligence tests have relatively high reliability, and it is unlikely that the elimination from the variances of that part which is due to errors of measurement would raise the figure from 13% to more than about 14.5; nevertheless, such effect as there is must have lowered the difference between the sexes.

2. *The Composition of the Sample.*—Sampling was not quite complete, and a relatively small loss at the extremes would lower the difference appreciably. The Bath survey, in which the sampling was practically complete, does in fact indicate a higher value.

3. *The Nature of the Test.*—Good tests of general intelligence measure something which shows a wider dispersion among boys than among girls. It could reasonably be anticipated that different scales, highly though they all intercorrelate, vary somewhat in their efficiency in measuring that something; it is also to be expected that they contain in varying degree extraneous elements displaying no difference between the sexes. To say more would be pure speculation, but it can fairly be concluded that any given test will be imperfect, and to the extent that this is so the sex difference will be reduced.

Reviewing the available evidence, one might make two estimates of the amount by which the variability of boys exceeds that of girls. The most likely figure is perhaps about 17%. Because of the important practical consequences that follow, however, it seems preferable to select a conservative value—one which we can feel is almost certainly not too high. In view of the factors which must have tended to lower the ratio found in the Scottish survey, the figure of 13% would seem to provide this safe minimum.

Consequences of the Difference

The estimation of the difference has been considered in some detail. It is an important figure because we are unlikely to obtain a better one for a good many years to come. The dislocation of populations in most countries will make the task of sampling too difficult; and even in the United States it will be a long time, in all probability, before investigators can turn their attention to a new survey on an adequate scale. As we have seen, the figure of 13% for the greater variability of boys is conservative; it is extremely unlikely to be too high, though it may well be somewhat too low.

Accepting this figure, we can calculate the ratio of boys to girls in different portions of the range of intelligence. In the middle of the distribution—among, say, the 80% of persons nearest to the mean of the whole population—the disproportion is relatively small; but outside these limits it becomes considerable, and increases as more extreme fractions are considered. Thus the brightest 10% of boys are matched by 8.65% of girls; similarly for the dullest 10%. The brightest (or dullest) 5% are matched by just over 4% of girls. Beyond the level which cuts off the brightest (or dullest) 1% of boys there are three boys for every two girls. Beyond the extreme limit which cut off at each end of the scale one boy in every 1,000 boys, boys are twice as numerous as girls. Table I shows the percentage (or number per 10,000) of girls who correspond in intelligence to the brightest or dullest 10%, 9%, etc., of boys.

TABLE I

Cleverest (or Dullest) Boys per 10,000 Boys	Number of Girls of Corresponding Mentality per 10,000 Girls	Boys per 100 Girls
1,000	865	116
900	770	117
800	676	118
700	583	120
600	492	122
500	402	124
400	314	127
300	228	132
250	186	134
200	145	138
150	105	143
100	67	149
70	45	156
50	31	161
30	17·4	172
20	11·1	180
10	5·1	196

The comparison can be made in a different way. In a population composed of equal numbers of each sex how many boys and how many girls will be included in the brightest or dullest 10%, 9%, etc., of children of both sexes? These comparisons are given in Table II.

TABLE II

Cleverest (or Dullest) Children (%)	Numbers included per 10,000 (5,000 of Each Sex)		Boys per 100 Girls
	Boys	Girls	
10·0	534	466	115
9·0	483	417	116
8·0	432	368	117
7·0	380	320	119
6·0	328	272	121
5·0	276	224	123
4·0	223	177	126
3·0	169	131	129
2·5	142	108	132
2·0	115	85	135
1·5	87	63	138
1·0	59	41	144
0·7	42·2	27·8	152
0·5	30·6	19·4	158
0·3	18·8	11·2	168
0·2	12·7	7·3	174
0·1	6·5	3·5	186

What will sometimes be of interest is not the relative proportions among all those lying beyond a given limit, but among some section of that group. For example, one might wish to know the proportions of boys and girls in that portion of the range lying between the 90th and 95th percentiles—i.e., the children who are brighter than 90% of the population and duller than 5%. Any such figures can be obtained by difference from Table I or II. Thus from Table II the 500 children out of each 10,000 who lie between the 90th and 95th percentiles will be composed of (534–276)=258 boys and (466–224)=242 girls—a proportion of 107 boys to 100 girls. Table III shows some examples for successive portions of the range.

TABLE III

Successive Portions of Brightest (or Dullest) 10%		Number per 10,000 (5,000 of Each Sex)		Boys per 100 Girls
Percentiles		Boys	Girls	
90–95	or 10–5 ..	258	242	107
95–98	,, 5–2 ..	161	139	116
98–99	,, 2–1 ..	56	44	127
99–99·5	,, 1–0·5 ..	28·5	21·5	133
99·5–99·8	,, 0·5–0·2 ..	17·9	12·1	148
99·8–99·9	,, 0·2–0·1 ..	6·2	3·8	163
99·9+	,, 0·1– ..	6·5	3·5	186

Space does not permit the provision of graphs from which could be read off the proportions in any part of the range. It is hoped, however, that Tables I and II give enough detail to provide immediate answers to most practical questions.

Proportions deduced on the assumption of equal numbers of boys and girls, as in Table II, will be only slightly in error if applied to populations showing the sex ratios commonly encountered.

The consequences of the sex difference in regard to such practical matters as the planning of accommodation are evident. If, for example, it were decided that a particular kind of secondary education was to be provided for the brightest 10% of children, the allocation should be for 10.7% of boys and 9.3% girls. If facilities for a particular type of higher education were to be offered to the cleverest 5%, this should comprise 5.5% of boys and 4.5% of girls; if the figure for another purpose were 2%, the allocations should be 2.3 and 1.7. If university scholarships of some special kind were available for 1% of the population, we should expect, if performance were proportional to mental endowment, to find a ratio of 3 boys to 2 girls among the successful candidates. If, following Galton, we term the one person in a thousand of surpassing intelligence a "genius," we can expect to find that at this level men are nearly twice as numerous as women.

It should be stated, however, that while there is some risk of allocating to girls too high a proportion of special educational facilities, there is no risk at all, certainly not for many years to come, that opportunities for adult achievement will be available for women on too generous a scale. It will be sufficient to quote Terman (1940). More than 20 years ago he initiated the researches embodied in successive volumes of *Genetic Studies of Genius*. An attempt was made to include the most gifted Californian children of their time; the sample of some 1,400 corresponded to about one-half of 1%. A follow-up after 16 years was designed to discover what use had been made of these outstanding gifts. So little chance on the average had the girls had, however, that Terman was forced to confine his analysis to the boys. It would probably be true to say that the greatest reservoir of unused high intelligence in our community is to be found in its female population, and that this loss is not exceeded by that due to any other cause, not even excepting social and economic handicaps.

At the other end of the scale, the dullest section of the population, matters are somewhat more complicated. The first complication is due to the occurrence of idiots and imbeciles. These are not to be regarded as part of the normal distribution of intelligence; they are the pathological dwarfs of mental stature, and have been excluded from the calculations of this paper. Their frequency is about 4 per 1,000 among children of school age. The figures in the tables therefore include only those mental defectives who correspond more or less to the feeble-minded group. To these figures must be added the 40 per 10,000 idiots and imbeciles; among them, too, there is some excess of boys, though for different reasons.

The second complication relates to the concept of mental deficiency, which implies a failure in social adjustment rather than simple intellectual retardation. Of those who on account of mental backwardness are potentially certifiable only a minority are in fact certified or need to be certified. Thus the provision for boys and girls respectively in colonies for mental defectives cannot be deduced simply from the distribution of intelligence levels. To mention two important differences between the sexes which affect certification, there are the illegitimate babies born to the girls and the greater tendency of the boys to come into conflict with the law.

With these reservations, which do not affect the provision of purely educational facilities for the backward, we may consider the effect of the difference between the sexes in dispersion of intelligence. Say, for example, it were decided that special schools (or certification under the Mental Deficiency Acts) should be provided for the dullest 5% of children, and that facilities for special teaching were desirable for the next 5%, then the allocations for this second less-dull group should be 2% for boys and 4.8% for girls. Suppose that the next 4% were regarded as suitable for special schools, then these would need to provide accommodation for boys and girls in the ratio of 13 to 11. If the lowest 1% are regarded as equivalent to those feeble-minded children whose backwardness is such that they may require certification (all these figures, of course, are selected simply as hypothetical examples), then there will be included in this fraction 3 boys to 2 girls.

Nature and Origin of the Difference

It is inconceivable that anything in our educational system could be responsible for a big difference in variances combined with an identity of means. It is almost as difficult to imagine that such an effect could be due to any differential influences operating during pre-school life. The source of the difference in variability between the sexes must therefore be inborn; I doubt whether any other possibility would occur to educational psychologists.

It can be concluded that the difference is almost certainly genetic, but beyond that the little that can be said is pure speculation. We know that the heterogametic sex—that characterized by the XY-chromosome pair—diverges more from the common pattern than does the homogametic sex possessing two X-chromosomes. Thus in mammals (the opposite is true in birds), if males are castrated early in life, then development is greatly modified and in bodily characteristics they tend to resemble the female rather than the male. On the other hand, early castration of the female produces much smaller changes. The male is the more highly specialized form, and the higher death rate at practically all ages may be an indication of the cost that this entails. Is a greater dispersion a consequence of the greater specialization? I am not aware of any clear indication of this in regard to physical measurements. For example, Pearl (1940) lists a large number of coefficients of variation. Using this criterion, 60 studies which included both sexes show that males were more variable in 29 instances, females in 31. Of course, in physical measurements interpretation is greatly complicated by the difference in means; it is the identity of the means which makes the analysis so straightforward in the case of general intelligence. Is it to the advantage of the species that in regard to intelligence males should be more and females less variable? It may be so, though it is difficult to see why.

There is little to be said, therefore, except that the difference exists; that a reasonable estimate can be made of its extent; that the practical consequences are of considerable importance; and that the difference, whatever may be the underlying reasons for its existence, is almost certainly genetic. It is to be hoped that future studies will reveal in more detail the mental qualities in which the sexes differ in variability, together with those in which they do not. The study of mental growth may well be facilitated by using our knowledge of this curious phenomenon.

Statistical Appendix

The fitting of the normal curves to the data for the boys and girls of the Scottish and Bath surveys is shown in Table IV.

TABLE IV.—*Fitting of the Normal Curves, Scottish and Bath Surveys*

	Scottish Survey		Bath Survey	
	Boys	Girls	Boys	Girls
n	44,210	43,288	1,742	1,606
s_1	176,867	172,767	36,144	33,016
s_2	819,755	787,189	840,216	747,194
s_3	4,145,957	3,896,169	21,061,212	18,163,630
s_4	22,252,871	20,448,001	558,389,232	467,905,502
S_2	112,179	97,658	90,280	68,454
S_3	−31,132	−25,110	−118,420	−11,662
S_4	653,926	531,877	12,173,174	8,426,730
k_1	4·000,61	3·991,11	20·748,6	20·557,9
$\pm k_2$	0·007,576,0	0·007,219,2	0·172,53	0·162,96
$\pm k_3$	2·537,5	2·256,0	51·855	42·651
$\pm k'_2$	0·013,746	0·012,895	1·574,1	1·464,2
k_2	2·454,1	2·172,7	51·772	42·567
k_3	−0·704,23	−0·580,11	−68·097	−7·275,1
k_4	−4·515,5	2·973,1	−1064·59	−197·45
g'_1	−0·183,18	−0·181,14	−0·182,81	−0·026,20
$\pm g'_2$	0·011,649	0·011,773	0·058,638	0·061,066
g'_3	−0·749,74	−0·629,80	−0·397,19	−0·108,97
$\pm$	0·023,298	0·023,545	0·117,21	0·122,06

Notation: Fisher's *Statistical Methods* (1941).
Units of Grouping: Scottish Survey, 10 points score; Bath Survey, 5 points Otis I.B.

In the published tables of the Scottish survey, the grouping is coarser than is desirable; the effect of this should not be serious, however, and the deductions to be drawn are very unlikely to be materially affected.

A further point about the Scottish figures is that raw scores have been used, uncorrected for age differences. The range of

age was 12 months. Trial shows, however, that the variation due to differences in age is very small indeed compared with the variation between children at fixed age. Furthermore, owing to a (non-significant) difference in the regressions, the ratio of the variances when adjusted for age variation does not differ, up to the number of figures used in this paper, from the ratio calculated using the raw scores. Accordingly it seemed simpler to avoid this complication.

The all-important point is the normality of the distribution of general intelligence, for upon this assumption depend any further deductions. It is well known that the frequency distributions yielded by any good intelligence scale are substantially normal. Group-test results, however, are apt to show departures, especially at the extremes. This is to be expected, for in a group test the same set of questions is used for all children, and even at the optimum age of 11 the test tends to be either too difficult to sort out the very dull at one extreme, or not difficult enough to sort out the very bright at the other; both effects are often seen simultaneously. It will be observed that there is a moderate degree of negative skewness in the frequencies of the Scottish survey—this applying to both sexes. This is also true of the boys in the Bath survey; very poor results on the advanced Otis scale, however, were less numerous among the girls, and the tendency to artificial bunching together is so little marked among them that the skewness is negligible. All the distributions are leptokurtic; this is doubtless to be attributed to a failure to spread out the children efficiently at both ends of the scale. Once again the Bath girls show a smaller departure from normality than do the boys.

There is reason to suppose, however, that these departures from normality are due to the construction of the tests and not to any underlying departure from normality in the distribution of general intelligence—at least, until very extreme limits are reached. Well-designed individual scales, which provide for each child a series of tests adapted to its mental abilities, would probably reveal a closely normal frequency curve. The Bath group provides evidence in regard to the lower end. In this group the dullest children on the Otis scale, amounting to about 23% of the whole group, were retested individually on the Stanford-Binet scale, as described in the fourth paper of the series dealing with the Bath experiments (Roberts *et al.*, 1938b). There was no significant departure from normality down to an I.Q. of about 45, which is three and a half standard deviations from the mean—a point outside the range discussed in this paper.

Convincing, even if indirect, evidence regarding the other extreme is provided in Vol. 1 of Terman's *Genetic Studies of Genius* (1925). The figures in Chapter 3 seem to me to give a clear indication that we are taking no undue risk in basing our calculations on the assumption of normality up to the 0.001 point. Terman's whole group of 1,444 included 831 boys and 613 girls, or 136 boys per 100 girls. Terman estimated that his group was about 0.5% of the population sampled. Using the estimate of this paper, the expected number of boys per 100 girls among the brightest 0.5% is 158. Apart from the fact, however, that the brightest 0.5% could not be separated off with complete efficiency, there was undoubted bias in the sampling, as is discussed at some length by Terman. In the light of present knowledge it seems clear that this must have minimized the difference considerably. To give one example, private schools were omitted; and if the effect of this is the same in the United States as it is in this country, it would lead to a heavy disproportionate loss of bright boys.

It is the differences within the sample itself, however, which provide the convincing evidence. Stanford-Binet I.Q.s are given for 1,024 children. Dividing them according to I.Q., the results are as follows:

Stanford-Binet I.Q.	Boys	Girls	Boys per 100 Girls
144–	221	207	107
145–154	206	172	120
155+	132	86	153

Results are also given for 370 children found at high schools. The overall proportion of boys is much higher, but, once again, within the group the disproportion increases with rising score.

Terman Group-test Scores	Boys	Girls	Boys per 100 Girls
194–	83	53	157
195–204	122	53	230
205+	46	13	354

Whatever the effect of bias in sampling, therefore, upon the composition of the whole group, it is evident that within this highly selected sample of very gifted children the disproportion in numbers of boys and girls increases sharply as intelligence rises, exactly as would be deduced if the consequences of normal dispersion hold up to these extreme limits.

The observed distributions of the group-test results are quite markedly leptokurtic. This has a substantial effect on the variance of the variances; accordingly the estimates of the fourth cumulants have been used in calculating these.

If two series of measurements having the same mean but different variances are added together it is impossible for all three distributions to be strictly normal. Even at the 0.001 point, however, this leads to a discrepancy of only 3%, so that the values of Tables I and II are not appreciably affected.

Summary

It is one of the most curious facts in human biology that in regard to general intelligence boys should be considerably more variable than girls. This is all the more remarkable because there is no difference in average performance. Girls tend to be grouped closer to the mean for the whole population, boys to spread further out into extremes either of brightness or of dullness. Not much can be said as to the nature and origin of the difference except that it is almost certainly inborn. The available data, however, leave no room for doubt as to its reality; furthermore, they are sufficient to yield a tolerably close estimate of its size. Adopting a conservative figure, it is found, for example, that the brightest (or dullest) 1,000 children in every 10,000 will be composed of 534 boys and 466 girls; the brightest (or dullest) 100, of 59 boys and 41 girls. At the extreme limits considered, the brightest (or dullest) boy in every 1,000 boys will be matched by only one girl of similar mentality in every 2,000 girls. The consequences in regard to planning both for the bright and for the dull are of considerable practical importance. Tables are provided from which can be read off the corresponding proportions of boys and girls to be expected in different portions of the 10% at either end of the range of mentality.

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There is not to be any change in the superannuation provision for nurses and midwives in the service of local authorities, but a separate fund is to be set up for those in the employment of voluntary hospitals and approved organizations where the Rushcliffe and Taylor salary scales have been adopted. This is, briefly, the main recommendation of the joint subcommittee for England and Scotland, which has been considering superannuation for nurses and midwives (Cmd. 6603, H.M. Stationery Office; 9d.). All nurses and midwives to whom the Fund applies must belong, but those who are now contributors to the Federated Superannuation Scheme may elect to remain in it. [This latter scheme, which came into operation for voluntary hospitals in 1928, will remain available for nurses outside the scope of the new Fund, such as those in private practice.] Provision is made for interchangeability with local government schemes, and the benefits recommended under the new fund are on a similar basis: minimum qualification for pension to be ten years' contributing service; retirement compulsory at age 60, with the option of retiring on or after 55 on completion of thirty years' service; pension to be based on the average salary and emoluments of the last five years of service and to be at the rate of 1/60th for every year of contributing service, subject to a total maximum of 40/60ths of such average service; pensions to be payable on permanent incapacity on the same basis as for age, with a minimum of 20/60ths and subject to the completion of ten years' contributing service; all salaried service since joining the Federated Superannuation Scheme to rank as contributing service

OBSERVATIONS ON LIGATURE OF THE PATENT DUCTUS ARTERIOSUS

BY

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These remarks are based on the experience gained in 14 cases in which ligation of a patent ductus arteriosus has been performed. Twelve cases were uncomplicated by infection and in only two was endocarditis present. In 10 cases the patients were females, and the ages varied between 5 and 31 years. In the non-complicated cases the patients were all slightly stunted in growth and the majority were breathless on exertion, but only one showed any signs of cyanosis.

Method

The operative technique was similar in all cases. The approach was that described by Gross. The patient is placed on his back with a small sandbag under the left shoulder and upper part of chest, with arm extended above the head, thus allowing a slightly left lateral approach to the mediastinum. An incision is made along the second intercostal space, curving upwards to the axilla. It is found that splitting the pectoralis major rather than cutting it across gives sufficient access. The pleural cavity is opened through the second space and the second costal cartilage divided obliquely close to the sternum; in most cases the internal mammary artery is not interfered with, but if it is injured it can easily be ligatured. After the pleura is opened a single rib-spreader is introduced; the lung collapses away from the mediastinum and is lightly packed off with a gauze roll. In only one case were adhesions found between the lung and mediastinal pleura, and these were readily separated. On the mediastinal wall the phrenic nerve can be seen shining through the pleura, and an incision is made in the pleura parallel with the nerve and about an inch below it. There is a marked difference in the access to the operative area in children and adults: in the latter the arch of the aorta is much higher and is situated more deeply, thus increasing the difficulty of the operation; while in children the arch and pulmonary conus are immediately beneath the second space and the operative area is readily accessible.

After making the pleural incision it is advisable to clean the inner surface of the pleura on the lower side before increasing access to the mediastinum, as by doing so any small veins that may be present are separated, and these, falling away into the lax tissue, cause no further trouble or, if they have to be dealt with, can be picked up more readily and ligatured.

Blunt dissection backwards and upwards towards the arch of the aorta discloses the recurrent laryngeal nerve tightly winding round the aorta, and running more from right to left than is realized. This landmark immediately indicates the upper and posterior point of the ductus, and by working down to the pulmonary artery the left edge of the ductus is defined. The anterior and the right edge are more difficult to dissect out; at first sight there appears to be no space between the pulmonary artery and the inner surface of the arch of the aorta, but by slow blunt dissection a space is determined and the right border of the ductus defined. There seems to be considerable variation in the upward prolongation of the pericardium at this point, and in several cases fluid was present in the pericardium. When this occurs the pericardium, which is thin at this point, tends to bulge slightly into the operative area and obscure the view. In one case the pericardium was punctured and fluid oozed into the mediastinum throughout the operation.

The ductus itself, when defined, is very short and runs much more antero-posteriorly than one expects. Gentle traction with a finger on the pulmonary artery helps very considerably to define the ductus, allowing the operator more readily to free the posterior surface. This has to be done with great care by gently passing curved forceps behind it, as it is at this point that the ductus may be torn. In one of my cases this apparently happened towards the end of the dissection, but I was able to place the ligatures round the ductus, which stopped the bleeding.

When the ductus has been defined, pressure on it stops the very marked thrill of which the operator has been conscious throughout the proceeding. It is stated that the flow of blood through the ductus is from the aorta to the pulmonary artery; one would therefore expect that the amount of pressure to obliterate the ductus would be similar to that required to obliterate any artery. This, however, is not so: very light pressure, such as suffices to obliterate a vein on the back of the hand, is all that seems necessary, suggesting that the pressure in the ductus must be low and the blood flow may be from the pulmonary artery to the aorta, this being permitted by the eddy in the concavity of the arch. In one case the ductus was so thin that blood could be seen through the wall, and the flow appeared to be from the pulmonary artery to the aorta; but this point requires further investigation.

The ductus being freed, an aneurysm needle is passed and, contrary to Gross's views, I prefer to pass it from left to right. Care has to be taken that the recurrent laryngeal nerve is kept away from the ligatures, which is usually quite easy as the nerve is wrapped so closely round the aorta. No. 8 silk is used as ligature material, and it is waxed so that it runs easily. The moment the first ligature is tied the thrill disappears; in one case the ductus was so large in diameter and short in length that after tying the second ligature the first was found to be quite slack, and it had to be removed and another placed in position.

The incision in the mediastinal pleura is then sewn up and the lung re-expanded by positive pressure. A catgut suture is passed through the cut ends of the costal cartilage with a cutting needle—approximating the cut edges of the cartilage and preventing the unsightly appearance of an overlapping cartilage—after which the intercostal space is closed with sutures.

The rest of the wound is sutured with care, as unfortunately this particular incision tends to heal with an unsightly scar. In the last cases I have made the skin incision curve downwards almost to the nipple and then upwards to the anterior axillary line, and the subsequent scars have been less unsightly. The left upper arm is lightly bandaged to the side of the chest wall for 24 hours to prevent movement of the pectoralis major.

The convalescence of the uninfected cases was uneventful with the exception of one (Case 12). A radiograph on the third day usually showed the pressure of a small pneumothorax at the apex, and in some cases a little fluid. Both these were rapidly absorbed, and the patients were allowed to sit up in about 14 days; children were allowed up earlier.

Case 12 requires special note. This patient was an undersized girl of 5½ who was in hospital for some little time before operation and had her adenoids removed about three weeks before the ductus was tied. The operation was uneventful and the child was allowed up on the sixth day. On the tenth day she had a temperature of 102°, which persisted without any apparent cause. A blood culture showed a pure growth of *Staph. aureus*. She was transferred to the penicillin ward of the Middlesex Hospital, and after treatment the temperature fell; subsequently it rose again, and a fresh blood culture produced a staphylococcus that was resistant to penicillin, and she eventually died. This case calls for a serious review of the procedure, but after careful consideration of all the facts I do not think that the operation can be held responsible; if anything, the argument for ligation is strengthened, as these patients with a patent ductus appear to be liable to start an endocarditis after an infection that is of little or no consequence in the normal person. The two infected patients both died. In one sulphonamide drugs had little or no effect; in the second they controlled the temperature for short periods only and eventually ceased to act.

It is too soon to say what the ultimate fate of these cases may be. One of the children is now taking up tap-dancing as a profession; the young male (Case 1) has been accepted for the Services. The others have lost their breathlessness on exertion, and the earlier ones that have recently been reviewed have improved in general health and physique.

It would seem that there is a case for the tying of an uncomplicated patent ductus. The risks attending such a persistent deformity have not yet been accurately assessed, but that there is a definite risk of infection which has a grave prognosis is unquestionable. Apart from this, however, the tying of the

ductus restores the patients' circulation to normal, breathlessness disappears, there is a marked improvement in their appearance, and a noticeable change for the better occurs in the mental condition. The last-named improvement is noticeable in the youngest patients, who from rather "solemn little owls" become bright and cheerful children.

Notes on Cases

Case 1.—Male aged 16. Admitted 2/12/41; discharged 23/5/42. Rejected by medical board on discovery of albuminuria and an abnormal heart. No symptoms. No evidence of circulatory inefficiency. Continuous murmur to left of sternum in pulmonary area. B.P. 140/75. Albuminuria was transient, and was never detected after the operation. A patent ductus was ligated on 14/3/42.

Case 2.—Girl aged 18. Admitted 5/5/42; discharged 12/7/42. Referred from medical board for morbus cordis. Harsh murmur and thrill throughout cardiac cycle in 2nd and 3rd left interspaces. B.P. 120/70. No evidence of circulatory failure. E.C.G. normal. Considered to be a case of uncomplicated patent ductus. Ligated on 2/6/42; uneventful convalescence.

Case 3.—Married woman aged 26. Admitted 15/6/42. Died. Known to have had congenital heart disease all her life. Activities always reduced. Pyrexial illness and increasing dyspnoea dating from tooth extraction two months before admission. Examination showed incipient circulatory failure; heart enlarged; murmur of patent ductus and loud systolic at apex. Early finger-clubbing. Positive blood culture of non-haemolytic streptococcus. Diagnosis: subacute bacterial endocarditis on a patent ductus; this was ligated on 19/6/42. Within a month after operation there was evidence of aortic valve involvement. Deterioration was rapid and death occurred two months after operation. Necropsy revealed extensive vegetation on the pulmonary artery and on the pulmonary valves.

Case 4.—Girl aged 10. Admitted 9/7/42; discharged 8/8/42. Complained of asthma since age of 4. Known to have had congenital heart disease since 6 months old. Pale and under-developed child. No symptoms or signs of inefficient circulation. Characteristic patent ductus murmur and thrill in 3rd left interspace. Ligation on 26/7/42.

Case 5.—Married woman aged 31. Admitted 28/8/42; discharged 31/10/42. Many years' history of dyspnoea on slight exertion, activities being considerably limited. Heart not enlarged; systolic thrill and continuous murmur in pulmonary area. B.P. 120/85. No circulatory failure. Radiograph revealed enlarged pulmonary artery. E.C.G. normal. The patent ductus was ligated on 29/9/42. Convalescence was uneventful.

Case 6.—Spinster aged 25. Admitted 9/9/42; discharged 23/10/42. Rejected from military service because of presence of patent ductus arteriosus. She had experienced rather more dyspnoea than is normal on exertion, but there were no other symptoms suggestive of her disease. The ductus was ligated on 24/9/42, after which the typical murmur entirely disappeared. Convalescence was uneventful.

Case 7.—Girl aged 9. Admitted 3/11/42; discharged 6/12/42. This girl had not experienced any abnormal symptoms, but was pale, slight, and asthenic, weighing only 3 st. 12 lb. A typical machinery type of murmur was heard in the pulmonary area together with a thrill. She had a low diastolic pressure. B.P. 120/55. An E.C.G. showed a normal curve, and a radiograph slight prominence of the pulmonary artery. The patent ductus was ligated on 19/11/42, after which all physical signs disappeared. Convalescence was uneventful.

Case 8.—Girl aged 12. Admitted 2/3/43; discharged 18/4/43. This patient complained of palpitations and breathlessness on mild exercise. The symptoms were relatively slight and she always felt well apart from breathlessness. At school she took part in swimming and physical training. She was well built. Her heart was normal in size. B.P. 135/70. Murmur was hardly a continuous one in the pulmonary area, being scarcely audible in diastole. No thrill was palpable. Ligation of the patent ductus was done on March 23, after which she had an uneventful convalescence, apart from a small hydropneumothorax. There were no abnormal physical signs in the heart.

Case 9.—Girl aged 21. This patient was admitted with a history of prolonged inactivity due to dyspnoea and exhaustion on exercise for at least seven years. She was well built, and examination showed no signs of heart failure. There was a loud continuous murmur in the pulmonary area accompanied by a thrill. No other signs of an additional congenital lesion were observed. The patent ductus was ligated on 6/4/43; the murmur was quite inaudible afterwards, and her convalescence was uneventful.

Case 10.—Boy aged 6½. This boy was quite fit on admission, but was small for his age. He had been followed up for some time on account of patent ductus arteriosus, but there was no evidence of disability from this. Examination revealed a characteristic to-and-fro murmur, but there was no thrill over the 2nd left interspace. Ligation of the ductus was carried out on 13/8/43. His convalescence was completely uneventful, and the heart sounds were subsequently normal. This case is particularly noteworthy for the extremely small amount of disturbance which the operation caused. The boy was up and running about within a week.

Case 11.—Boy aged 5½. The patient had had dyspnoea on exertion for a period of about a year and failed to grow. He was an undeveloped child—height 43½ in., weight 35½ lb.—slow in speech but mentally normal. Pulse 110, regular rhythm; no clubbing; typical murmur running right through systole and diastole, best heard in pulmonary area; slight right-sided hypertrophy. Temperature normal; no evidence of infection. Radiograph showed very slight dilatation of pulmonary artery but no general enlargement. Ductus ligatured on 18/3/44: small ductus, about 1/4 in. The murmur had gone entirely after operation. On the evening of operation there was a small pneumothorax on the left side, and the next morning some surgical emphysema on the left side of the chest. These signs soon cleared up. Discharged on 30/3/44, symptom-free, left lung well re-expanded.

Case 12.—Girl aged 5½. Admitted 27/8/43 with an uncomplicated patent ductus arteriosus. Owing to the presence of some pharyngeal sepsis, adenoidectomy was performed on 24/9/43. After this she was very well, and was considered fit for operation. On 12/10/43 the ductus was ligated and found to be about 1/3 in. in diameter. Immediate post-operative convalescence was good, but on the ninth day she had sudden pyrexia, which subsequently proved to be due to a *Staph. aureus* septicaemia. This failed to respond to sulphathiazole and later to penicillin. She subsequently died on 24/12/43. No necropsy was performed.

Case 13.—Girl aged 20. Admitted 7/2/44. Was known to have had a patent ductus since shortly after birth. She had been well until about three weeks before admission, when she had an attack of "pneumonia." As her temperature did not settle she was seen by Dr. Morland, who diagnosed a septic infarct. On admission a blood culture gave a profuse growth of *Str. viridans*; after a blood transfusion and a course of sulphathiazole her temperature appeared more controlled. The ductus was ligated on 8/3/44, and after two days her temperature, which had been 103°, was again controlled by sulphonamide drugs. When these were discontinued the temperature rose again and she had a further infarct. Her condition then slowly got worse; she had infarcts in the kidneys and later in the brain.

Case 14.—Boy aged 7. Admitted 30/10/44. This boy had previously been seen, in consultation with Dr. Sheldon, when he was running a temperature thought to be due to endocarditis; but there was no growth on blood culture and his temperature reacted to a course of sulphonamides. He subsequently had his tonsils removed after a prophylactic course. It was decided that in view of his previous illness he should have his ductus ligatured; this was done on 4/11/44, and he was given a further course of sulphathiazole before and after operation. The ductus showed no evidence of old infection. He made an uneventful recovery, and was discharged on 21/11/44.

Dr. M. D. Nosworthy was the anaesthetist for all these cases. The anaesthetic was closed cyclopropane and ether. Blood-pressure readings and pulse rates were taken by him during the operation; no consistently demonstrable changes in pulse rate or blood pressure were recorded when the ductus was tied.

I wish to thank Dr. East, Dr. Sheldon, Dr. Maxwell, Dr. Cedric Shaw, Dr. Courtney Evans, and Dr. Andrew Morland, who have sent me the cases recorded; also Dr. Brigden, who has collected most of the case notes.

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The May issue of *The World's Children* (Save the Children Fund, 20, Gordon Square. W.C.1, 6d.) includes descriptions of various phases of child life—in China (by Jessie Booth), Nigeria (the Rev. E. A. Odusanwo), on the canals of Britain (by Ruth Layton), and in Cairo (Jeanne Marie Small). Dr. E. H. M. Milligan puts forward an idea for a "child international" to unite all child welfare organizations in Britain and the world, and the editor pleads for greater development of child education through the film, as was attempted in France before the war and is now being encouraged in the U.S.A.

PSYCHOTIC BATTLE CASUALTIES

BY

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Neurosis arising from battle stress has been repeatedly investigated in the last five years. Psychosis precipitated in the same way is rarer but more interesting, and has largely escaped attention. The object of this article is to classify cases of psychosis induced by stress of battle, and to give examples which, though psychotic, differ from the classical types of psychosis both in their clinical forms and in their duration, which is temporary.

Cases admitted to the psychosis ward of a British psychiatric hospital in Normandy during a period of fierce fighting have been classified as follows:

	No. of Cases
1. Psychoses of classical type, unrelated to battle stress	11
2. Psychoses precipitated by battle stress, but clinically indistinguishable from Group 1	36
3. Temporary psychoses precipitated by battle stress and differing from recognized types:	
A. Reactions to stress and fear:	
(i) Showing confusion	35
(ii) Showing regression	5
(iii) Acute anxiety states	12
Total	52
B. Reactions to awareness of failure to tolerate the stresses of battle	17
C. Reactions to death of comrades	22
Total	91
	138

Discussion is confined to cases in Group 3, of which the following typical examples are given.

A. Reactions to Stress and Fear

(i) *Showing Confusion.*—Tpr., aged 29; service 4 years. The family history was negative, and the personality stable prior to Army service. He had seen much service as a tank driver in the Middle East. In 1942, after severe battle stress, he suffered from "loss of memory" for a week. On account of this and otitis media he was transferred to the fitters' workshop. In Normandy he was again employed as a tank driver. He continued duty for a month, taking part in several attacks before he broke down.

On admission he was confused and disorientated. He showed no fear, but was euphoric, irritable, easily annoyed, and was rambling and garrulous. He completely misinterpreted objects and events about him, to conform with his belief that he was still in the midst of a battle. His memory was very poor for both past and recent events. During the first week he gradually improved, becoming orientated and recovering his memory almost completely. He eventually became willing and fit to return to his earlier employment as fitter.

(ii) *Showing Regression.*—Pte., aged 25; service 9 years. This man passed down the line of evacuation and was admitted in a stuporous state, clutching a doll in his arms. He lay curled up in bed like a child, clinging to the doll as a drowning man to a straw. If approached or addressed he showed extreme terror, and tried to hide under the bedclothes. On the fifth day he became lucid and accessible. He stated that a mate who had been killed had obtained the doll for his children. The psychotic withdrawal was replaced by symptoms of an anxiety state.

(iii) *Acute Anxiety States.*—Pte., aged 27; service 9 years. This patient had had an unhappy childhood: his parents had separated, and he had been reared by a drunken foster-mother. His previous personality was stable. He had been employed as a mess waiter, but in the invasion was used as an infantryman. He had been in action for four weeks since D day, when a shell landed on the edge of his trench. He broke down into a state of terror and confusion.

On admission he was in a condition of extreme terror, believing that a Messerschmitt was after him all the time. He interpreted every sound as an approaching plane or shell. His pupils would then dilate; sometimes he tried to run away, and at other times would bury himself in abject terror beneath the bedclothes. After three days of gradual improvement he became lucid. The condition was then one of acute anxiety: he was easily startled, and complained of headache aggravated by noise.

B. Reactions to Awareness of Failure to Tolerate the Stresses of Battle

Sgt., aged 21; service 4 years. There was nothing relevant in the family or personal history. He had volunteered, and had served in Iceland. He had been in action in Normandy for five weeks. He had felt increasingly anxious, and finally became panicky and uncontrollable; he was also depressed, with a strong suicidal tendency.

On admission he gave a clear account of himself except for a period of two days when he had been in a field dressing station in a confused and depressed state. He was miserable, solitary, and self-reproachful. He asked to be left alone, as he considered himself unworthy of attention when so many better men than he had been killed. With the help of treatment he became much less depressed during the next few days, but remained in a state of moderate anxiety.

C. Reactions to Death of Comrades

Tpr., aged 20; service 2 years. There was nothing relevant in the family or personal history. He had served satisfactorily as a tank driver in Normandy for eight weeks. Then his tank, going far forward on a reconnaissance, was hit, and the tank commander was killed by an 88-mm. shell. The patient, after further severe stresses, was rescued: he was then stuporous.

On admission he was depressed and semi-stuporous, with some agitation. He was almost mute, but it could just be ascertained that he thought he was responsible for his tank commander's death, and that he could hear accusing voices. During the subsequent week he improved considerably, but remained mildly depressed. He tended still to blame himself, and lacked self-confidence.

Discussion

Cases in Group 3 do not fit readily into any established classification of psychoses. These patients are considered psychotic because they show a marked detachment from reality, together with various combinations of other typical characteristics, such as confusion, mutism, delusions, hallucinations, psychomotor retardation, flexibilitas cerea, depression, or elation.

The cases differ from the classical forms of psychosis in several ways: they usually arise in men with good family and personal backgrounds; the condition is precipitated by severe and usually prolonged stress; the prodromal symptom is a sense of increasing anxiety, but this is not always present. The content of delusions, hallucinations, or emotional disorder is derived from experience immediately before the breakdown, and is less fixed and more accessible to reasoning than in the typical psychotic. The most notable difference is in the duration: the psychotic manifestations improve steadily, and disappear with striking suddenness at the end of three to seven days. Symptoms of neurosis, usually an anxiety state, are subsequently presented, often after a lapse of a day or two, during which the patient has no complaints and appears contented. This group thus forms an interesting link between the psychoses and the neuroses.

Treatment for the first few days consisted of rest, reassurance, and just enough sedation to ensure sleep at nights. During the day, especially as improvement occurred, every effort was made to restore contact with reality and to correct misinterpretations of surroundings. In the stage of recovery the patient was encouraged to recall his battle experiences fully. Where necessary, an intravenous injection of pentothal sodium was used to facilitate this abreaction of traumatic incidents.

Summary

A series of 138 psychotic casualties arising in the Battle of Normandy have been classified.

Attention is drawn to a psychosis of short duration and distinctive clinical form which was present in 91 of these cases.

The special features of this psychosis are: (*a*) sudden onset after battle stress in men with good family and personal histories; (*b*) typical psychotic detachment from reality, with other psychotic manifestations such as confusion, delusions, and hallucinations; (*c*) rapid recovery from the psychotic state, usually within one week; (*d*) subsequent development of neurosis.

Treatment consisted initially of rest and reassurance. Later, the traumatic battle experiences were brought back into full consciousness.

I wish to thank Col. R. J. Rosie for permission to publish this report on cases seen in the hospital under his command.

C. M. Finsley (*Arch. intern. Med.*, 1945, **75**, 82) states that pneumococcal endocarditis occurs in about 3% of all pneumococcal infections and is responsible for about 5 to 10% of deaths due to pneumococcal infections. The aortic and mitral valves are infected in 36 and 33% of the cases respectively. Purpura, splenomegaly, and infarction are less common than in subacute bacterial endocarditis. The disease is usually rapidly fatal.

ACUTE INTESTINAL OBSTRUCTION DUE TO DRIED FRUIT

A REPORT OF TWO CASES

BY

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The impaction of a foreign body is a rare cause of acute intestinal obstruction—according to Handfield-Jones and Porritt (1943) in 0.3% of the cases. The following cases, which were due to the ingestion of dried fruits, are worth recording.

Case I

A soldier aged 37 was admitted to hospital with signs of acute intestinal obstruction. Abdominal pain had begun about 24 hours previously. It was not very severe at first, but had latterly increased in intensity, and when seen by us the patient was having very marked attacks of intestinal colic, with much effortless vomiting. Dehydration was present, and an intravenous saline drip was started.

Operation was carried out two hours after admission. The abdomen was opened by a right paramedian incision in the lower region. There was a small quantity of clear fluid in the peritoneal cavity. The small bowel was very distended and the dilated loops were followed down to a point about 5 feet from the ileo-caecal valve. At this point there was a mass of firm material completely blocking the lumen of the gut. The bowel beneath was contracted and empty. With some difficulty the foreign material was pushed along the ileum and finally through the ileo-caecal valve into the colon.

The patient made an uninterrupted recovery, and three days later passed the foreign body. It consisted of a piece of vegetable-like material measuring 1½ in. by 1 in. by 1 in. The pathologist could not identify the exact nature of the vegetable, but the patient admitted, when questioned, that he had been eating dried fruits on the evening before the onset of the pain and that he had swallowed some of the pieces without chewing them very well, as he had been very hungry.

Case II

A cookhouse boy in the Merchant Navy, aged 16, was admitted to hospital in a comatose condition, and died soon after admission. The history stated that he had not felt very well when he arose that morning and had taken no breakfast. In the forenoon, about 7½ hours before his death, he had developed severe abdominal pain, which came in spasms and caused him to roll about his bed. When seen by the medical officer some hours later he had slight diffuse abdominal tenderness, but there was a point of extreme tenderness in the lower abdomen just to the left of the midline. The patient had vomited fairly large quantities of clear fluid. When seen by us the boy was comatose and showed signs of extreme dehydration. There was moderate abdominal distension. Preparations were quickly made for intravenous therapy, but he died before these were completed.

A post-mortem examination was carried out the next day. The body was that of a well-nourished youth. The abdominal cavity contained a quantity of slightly blood-stained material. The stomach and small bowel showed extreme dilatation. This distension was followed down to a point 6 in. above the ileo-caecal valve, where there was a mass of hard substance completely blocking the lumen. On opening the bowel two large pieces of apple were removed. One of them measured 3 in. by 1 in., and showed four small tooth-cuts which went through only a part of the thickness of the substance. The other piece measured about 3/4 in. square, and had no tooth-markings. The small intestine above the obstructed area had some blood-stained material in it, but in an upward direction the contents became whitish yellow in colour right up to the stomach, which contained a little grey material and much gas. The other organs of the body showed no abnormality.

Careful examination of the foreign bodies confirmed that they were pieces of dried apple which had swollen in the intestinal tract. Inquiries showed that the boy, who assisted the cook, had access to dried apple, which was being used at that time.

Comment

These two cases show the danger attaching to the ingestion of dried fruits without thorough mastication and unless they have been properly cooked. In the first the patient appeared to have "bolted" an excessively large piece of the cooked material. In the second case it seemed to be impossible for the boy to have swallowed such a large mass, and our inquiries showed, in fact, that there had been no official meal of the dried apples for some days beforehand; this suggested that he had actually eaten the untreated dried apple from the store, that he had found difficulty in chewing it, and that the fruit had become greatly swollen in the presence of the moisture in the intestinal tract and caused complete obstruction. The early collapse and death suggested that the obstruction had probably started primarily much higher in the small intestine than the position of the foreign matter suggested at necropsy. The very acute nature of the process was shown by the blood-stained material in the peritoneum.

REFERENCE

Handfield-Jones, R. M., and Porritt, A. E. (1943). *The Essentials of Modern Surgery*, 2nd ed., E. and S. Livingstone, Edinburgh.

Medical Memoranda

A Series of Unrelated Pathological Conditions in One Case

The findings in the post-mortem examination recorded below are unusual enough to warrant publication.

CASE HISTORY

The patient, a woman aged 49, had had no occasion to consult a doctor for eight years, but immediately before death, which was sudden, had complained of a pain between the scapulae. At necropsy the body was well nourished, but the general appearance was of a woman of 60. Externally there was nothing to indicate the cause of death. On opening the thorax the pericardium was seen to be full of blood. There was a tumour pushing up the diaphragm on the right side: this protuberance was about 3 in. in height from the level of the rest of the diaphragm, and its base was about 9 in. in circumference. There was a similar but smaller upward bulge of the diaphragm on the left side. On opening the abdomen these tumours were found to be herniae of the liver covered by a thin sheet of muscle. They were not neoplasms, but were protuberances of normal liver tissue.

The pericardium was then opened, and a small aneurysm of the ascending and transverse portion of the aortic arch was found to have ruptured into it. There was no free blood in the pleural cavities. The aneurysm was of the dissecting type, and had separated the coats of the aorta as far as a point about 2 in. above the diaphragm.

On opening the heart a well-marked degree of mitral incompetence was found: the endocarditis was evidently ancient history, for the lesions on the valve cusps were firmly fibrosed and organized. The heart muscle was hypertrophied and firm, without signs of dilatation. The aorta was atheromatous; the innominate, left carotid, and subclavian openings were all dilated and rigid; while the coronary vessels were atheromatous, dilated to double the normal size, and projected from the cut surface of the heart muscle.

The abdominal organs showed chronic venous congestion and the spleen was enlarged. The left renal vessels were dilated, the vein admitting a lead pencil with ease. The right kidney was small, but the vessels supplying it were also enlarged in relation to its size. Finally, there was a diverticulum of the jejunum about 12 in. below the duodeno-jejunal junction.

Microscopically the spleen showed replacement of pulp by fibrous tissue. The Malpighian bodies were prominent. There was well-marked endarteritis obliterans. The kidney showed a similar condition of the blood vessels, with degeneration of the Henle and convoluted tubules.

GAVIN DUNLOP, M.D.
J. J. MCCARTHY, M.B., B.Ch.

Worksop.

Oranges causing Alimentary Obstruction

The following two cases of alimentary obstruction caused by oranges may be of interest.

CASE I

A silicosis pensioner aged 56 was admitted to this hospital on Jan. 21, 1945. He gave the following history. At 8 a.m., 14 hours before admission, he was seized with an attack of colicky abdominal pain. This passed off, but recurred at intervals of a few minutes during the day. He had a normal motion in the morning. He ate some dinner, but immediately vomited it. He did not vomit again until after admission. The pain spread across the middle of his abdomen from right to left.

On examination the tongue was furred and the breath rather offensive. T. 98°, P. 80, R. 24. The patient did not look ill. The abdomen was slightly distended; there was tenderness over the whole of the right side of the abdomen. Guarding was generalized except in the left iliac fossa. Peristalsis was vigorous, with loud borborygmi. There was no rectal tenderness.

A diagnosis of small-bowel obstruction was made and laparotomy performed. On opening the peritoneum a little free fluid was found. The small intestine presented, engorged and distended. The whole of the jejunum and about a foot of the ileum were thus affected; the rest of the bowel was collapsed. At the junction of the two portions was felt, within the lumen, a semi-solid body containing a few hard lumps; it was about 1 in. in diameter. It was milked

down to a healthy part of the ileum and removed by opening the bowel. The cause of the obstruction was seen to be a white object, which opened, revealing itself to be the pith of half an orange with some pips. The patient made an uneventful recovery.

CASE II

A pit engine-man aged 66 came to the out-patient department on Dec. 18, 1944, with the story that for a week he had been able to swallow fluids only. Solids would stick when half swallowed and were regurgitated. He had lost some weight and complained of weakness, and his appetite was poor. No previous history of dysphagia; no voice changes.

On examination he was rather thin—in keeping with his story of a week's starvation. There were no signs of anaemia, and no cervical glands were palpable; the thyroid was normal; laryngoscopy showed no signs of disease. Respiratory and other systems appeared normal. A barium swallow revealed a hold-up at the lower end of the oesophagus, rather suggestive of malignancy. There was no dilatation of the proximal part. Oesophagoscopy on Dec. 29 revealed a white foreign body lodged at the lower end of the oesophagus, which appeared inflamed. As it was too large to pull through the tube the oesophagoscope and mass were withdrawn together. On close examination the foreign body was seen to consist of the rolled-up pulp of half an orange. The oesophagoscope was then passed easily to the cardiac orifice. Apart from some inflammation at the level of the obstruction, the oesophagus appeared normal.

Next day the patient was able to take an ordinary diet with scarcely any discomfort. A barium meal shortly afterwards revealed a suspicion of either malignancy or ulceration at the cardiac end of the stomach. Since discharge the patient's condition has been satisfactory.

Our thanks are due to Dr. H. M. N. Calder and Mr. R. S. Venters, respectively, for permitting us to publish these cases.

ALWYN S. JONES, M.B., Ch.B.
S. W. VIVIAN DAVIES, M.B., B.Ch., B.Sc.
Whitehaven and West Cumberland Hospital.

Intestinal Obstruction by a Foreign Body

In view of the recent importations of dried fruits from abroad there is quite a risk of intestinal obstruction following the ingestion without mastication of large morsels and their subsequent swelling in the alimentary tract. Although the present case relates only to an ordinary orange, the further possibilities of such cases should be kept in mind.

CASE REPORT

A woman aged 60 was admitted on the evening of Feb. 24, 1945, to the Derby City Hospital with a history of acute epigastric pain and continual vomiting since 11 p.m. the day before. Her bowels had last acted the previous morning. Examination revealed no distension of abdomen, but faeces in the rectum and a moist tongue. There was a small mass to the left and above the umbilicus, probably omentum in a para-umbilical hernia. This did not seem sufficient cause for her acute distressing symptoms, and after being placed on intravenous glucose-saline a laparotomy was performed. There was an obstruction due to an oval-shaped mass in the ileum about 2 feet from the ileo-caecal valve. This was removed and the intestinal wall repaired. The para-umbilical hernia was found to have spontaneously reduced itself. Examination of the mass (see Fig.) showed it to be half an orange.

The patient has artificial teeth, but they are not used because she cannot "master them." She vigorously denies swallowing part of an orange, but admits to sucking a half of one about 26½ hours previous to the appearance of symptoms.

I wish to thank Sgt. Fayres for taking the excellent photograph.

City Hospital, Derby. LEON RADCLYFFE, M.B., B.S.

Sulphonamide-resistant–Penicillin-sensitive

Just as bacteriological findings elucidated the treatment of empyema and explained the disasters after draining streptococcal effusions, so the dawn of penicillin with new rays of hope may help in cases of appendicitis where the streptococcal nature of the infection is known early enough and cultures show the sensitivity to sulphonamides and penicillin. This point is illustrated in a case of streptococcal subphrenic abscess following perforated gangrenous appendicitis recently admitted under my care.

CASE REPORT

A schoolgirl aged 16 was admitted to the Gloucestershire Royal Infirmary on Dec. 3, 1944, with the following history: On Nov. 30 she slipped in the mud when playing netball, and in the afternoon complained of severe pain in the right loin. This was followed by sickness during the night. The doctor called in suspected contusion of the right kidney. On the morning of Dec. 3 her condition was obviously serious and she was transferred to hospital. On admission her temperature was 101.8° and pulse 106, and the tongue was furred. She was tender in the right iliac fossa and the right loin and was resistant. Acute appendicitis was diagnosed, and an operation was performed immediately.

A muscle split incision revealed foul-smelling pus. The appendix was felt retrocaecally, but was not disturbed, and a wide drain was introduced. A course of sulphathiazole was given for five days, but her temperature remained between 100° and 102° and her pulse rate varied from 104 to 136 for two weeks. There was little discharge from the wound, but a faecal fistula developed, which closed after 10 days. There were no signs at the base of the right lung to suggest an abscess below the diaphragm and no collection could be felt either in the abdomen or in the right loin. There was, however, tenderness over the last rib. An *x*-ray examination with a portable apparatus was inconclusive. Sulphadiazine, 2 g. four-hourly, was administered at this stage, but though tolerated well did not influence the case clinically.

On Dec. 20 subphrenic abscess was suspected so strongly that exploration was decided upon. The twelfth rib was resected and an abscess between the liver and the diaphragm was evacuated by separating the liver from the thoracic wall. This was drained with a split tube. On Dec. 22 there was no improvement in her general condition, as would have been expected after drainage, but this was explained by Dr. E. N. Davey's report on the cultures of the pus—a growth of *Str. viridans*, which was sulphonamide-resistant but penicillin-sensitive. Dr. Davey advised immediate treatment with penicillin locally and systemically. This was carried out under his supervision.

The abscess cavity was injected with 2,500 units of penicillin four-hourly, and a solution of penicillin in saline (100,000 units per 1/2 litre) was introduced into the outer side of the thigh intramuscularly daily for 4½ days. On Dec. 23 her condition was critical, her pulse rate being 140, and she refused fluids.

The next afternoon there was a dramatic improvement in her condition. She was eager for her food and had obviously turned the corner. Her progress has been steadily maintained. Cultures from the wound on Dec. 24—48 hours after giving penicillin—grew a light growth of *Str. viridans*. After a further 48 hours the cultures were sterile.

COMMENTS

The knowledge that the cultures were sulphonamide-resistant and penicillin-sensitive undoubtedly saved this patient's life, for without it the permission to use penicillin would not have been granted. The effects of the penicillin were not obvious for 48 hours. It is clear, therefore, that there is no time to lose, and penicillin should be available immediately.

DR. E. N. DAVEY'S COMMENTS

This case stresses the importance of making a bacteriological examination of pus in all cases of infection, no matter how obvious the type may appear. The foul-smelling pus at the primary operation no doubt suggested a coliform infection, but, in view of the finding of streptococci in the subphrenic abscess, it raises the question as to the exact nature of the appendicular infection at the outset.

The necessity for the bacteriologist not only to report the nature of the organism but also to assess the sensitivity of the microbe to sulphonamides and to penicillin is also made evident, so that time and useless application of these new methods of treatment may be saved.

A difficulty in the application of penicillin treatment seems to be to ascertain when it is safe to discontinue its use. In this case we were guided (1) by the clinical improvement as shown by the return of pulse and temperature to normal; (2) by the fall of the leucocyte count from 16,600 per c.mm. (85% polymorphonuclears) at the time of the subphrenic abscess, collected on Dec. 16, 1944, to 8,600 per c.mm. on Dec. 27, 1944; and (3) by rendering the discharge from the wound sterile.

My thanks are due to Dr. Cairns Terry, physician, and Dr. E. N. Davey, pathologist, to the Gloucestershire Royal Infirmary, for their co-operation in this case.

ARNOLD ALCOCK, M.B., B.S.,
Surgeon to the Gloucestershire Royal Infirmary.

Reviews

THE FOETAL CIRCULATION

The Foetal Circulation and Cardiovascular System, and the Changes that they Undergo at Birth. By Alfred E. Barclay, D.M., F.R.C.P., Kenneth J. Franklin, D.M., F.R.C.P., and Marjorie M. L. Pritchard, M.A. (Pp. 275; illustrated. 50s.) Oxford: Blackwell Scientific Publications. 1944.

The larger and more important section of this book consists of a collation of the authors' researches carried on during the last seven years at the Nuffield Institute of Medical Research, Oxford. The technique adopted was a novel one. A foetal lamb near full term was delivered by Caesarean section. With respiration prevented, an intravenous injection of a contrast medium such as thorotrast or perabrodil was immediately made and the course of the latter in the foetal circulation was demonstrated by cineradiography. That recording was begun in some cases in less than thirty seconds after delivery speaks highly for the team's speed and dexterity. The results of their observations fall into two groups: the actual course of the foetal blood flow and the circulatory changes which occur at birth. With regard to the former, the authors confirm the view which was first enunciated clearly by Sabatier some 170 years ago and which since then has been a matter of such frequent controversy. The blood reaching the right atrium from the inferior (or posterior) vena cava passes for the most part through the foramen ovale (the via sinistra in the authors' idiom), while only a small portion of it reaches the right ventricle. In contrast to this, the blood returning through the superior (or anterior) vena cava passes in its entirety through the tricuspid orifice. Further, this method showed the rapidity with which at birth the foramen ovale, the ductus arteriosus, and the ductus venosus are functionally closed. Four minutes suffice for the ductus arteriosus, five to twenty-five minutes for the ductus venosus after ligation of the cord, while in just over five minutes after the first respiration the foramen ovale is no longer physiologically patent.

A criticism that many anatomists are likely to make of this part of the book is that the introduction of several fresh terms for old familiar ones—e.g., "crista dividens" for the annulus ovalis or "pars libera viae dextrae" for the Eustachian valve—is unnecessary and, indeed, unwarranted. Changing the names of the old landmarks does not help the wayfarer to follow the new paths more easily. The latter chapters of the book deal with the comparative anatomy and physiology of this subject and give a full and critical account of all that is known about the cardiovascular system in the human foetus.

The make-up of the whole volume with its wealth of illustrations is something of a luxury to the wartime reviewer, and the authors are to be most heartily congratulated both on the completion of their outstanding researches, in spite of the encroachment of war activities, and on writing such a very clear account of them.

SURGERY OF THE UROGENITAL TRACT

Urological Surgery. By Austin Ingram Dodson, M.D., F.A.C.S. (Pp. 768; illustrated. 50s.) London: Henry Kimpton. 1944.

The main theme of this book, as its title suggests, is the surgery of the genito-urinary tract, but the diagnosis and pathology of urological diseases are also considered. To help him in dealing with the subsidiary subjects the author has obtained contributions from various experts. Despite this, *Urological Surgery* can be looked upon as being a book on operative surgery, and a book which is to a great degree the expression of its author's personal experience. He makes no claim for originality in the various operative techniques he describes, which have been chosen because he happens to have found them the most satisfactory in his work. Because he writes from personal experience, he writes convincingly and with admirable clarity, and it is the clarity of the descriptions which makes *Urological Surgery* a valuable addition to the large library of books on this subject which has already come from across the Atlantic. As is to be expected of such a work, it is profusely and splendidly illustrated. Miss Helen Lorraine's drawings of the various stages of an operation—for example, nephrectomy—make surgery appear so simple that a reader might be tempted to undertake it without even bothering to refer to the text. It is a rare pleasure in these days of economy and skimping to hold in one's hand such a handsome volume, printed on thick white glossy paper, and illustrated so generously. The chapters do not, however, maintain a uniform level of excellence, and those devoted to the surgery of the kidney and of the bladder are better than those dealing with that of the prostate and the urethra.

The most disappointing paragraphs in the whole book are perhaps those which describe transurethral resection of the prostate, and, since Dr. Dodson is writing from personal experience, it would almost appear that he does not make much use of this particular method of relieving prostatic obstruction. It would also have been more helpful if the author had given more information concerning the pre-operative and post-operative treatment of prostatectomy. But apart from minor defects this must be looked upon as a very successful book, and one that can be highly recommended to surgeons requiring an up-to-date guide to the surgery of the genito-urinary tract.

THE ANATOMIST OF MELANCHOLY

The Psychiatry of Robert Burton. By Bergen Evans in consultation with George J. Mohr, M.D. (Pp. 129. $2.00 or 13s. 6d.) New York: Columbia University Press; London: Oxford University Press. 1944.

In the speed and turmoil of modern life we have all too little time to study the wisdom of the ancients and yet there is still a lot to be learnt from them, obscured though that wisdom may be by outworn theories and superstitions. The modern physician and psychiatrist may indeed be excused for shrinking from the task of exploring the digressions and complexities of the early 17th century divine. But if they read this fascinating, short, and well-written study they may well be tempted to dip into the pages of the old melancholic to see how many of the most modern and in some respects the most startling theories in psychiatry have been thought of before by someone of the first intelligence. Such a discovery does much to convince the reader of the truth of such theories, for all good intellects are sure to catch glimpses of truth, distorted as these may be by contemporary beliefs and lack of relevant knowledge.

A great deal of the *Anatomy of Melancholy* is autobiographical, though the inclusion of symptoms of very diverse mental illness, especially of the psychoneuroses, prevents it from being a description of what we understand as melancholia. There is little extant about Robert Burton's life from outside sources, but the authors depict him as a man full of resentments, continual self-depreciation, cloaking discontent and aggressiveness, with mingled gaiety and depression, based on possibly hereditary taints, deprivation of love in childhood, and frustration especially in his sexual life, which were the three main causes of "melancholy" according to Burton himself. As is pointed out in the conclusion, Burton differed from his contemporaries, and his followers for two or even three hundred years, in realizing that these conditions were mainly of psychological rather than physical origin, that treatment involved a finding of the cause, was assisted by an emotional bond between patient and physician involving trust and respect by the former for the latter and kindness for the former by the latter. If only attention had been paid to him Pinel's reforms might have been antedated by 200 years. The *Anatomy* is not a medical textbook, its author was not a doctor, but he was a wise man with an understanding heart.

Members of the medical profession owe a debt to Mr. Bergen Evans and Dr. Mohr for affording them the best sort of relaxation—that of very pleasantly learning more about their own subject.

BOOKS FOR NURSES

Operative Surgery Described for Nurses. By O. Stanley Hillman, M.S., F.R.C.S. Second edition. (Pp. 263; illustrated. 7s. 6d.) London: Faber and Faber. 1944.

101 Clinical Demonstrations to Nurses. By Hamilton Bailey, F.R.C.S. (Pp. 136; illustrated. 10s. 6d., plus 6d. postage.) Edinburgh: E. and S. Livingstone. 1944.

Two books for the nurse's library have recently been published. The first—*Operative Surgery Described for Nurses*, by Stanley Hillman—is really a second edition, though as the first appeared as long ago as 1927 a good deal of fresh material has

been added to cover the changes in surgical technique which have occurred in the interval. Thus we now find descriptions of operations upon the sympathetic nervous system and of such innovations as pinning the neck of the femur and cardio-omentopexy. The accounts of operations are brief but sufficiently detailed to enable the nurse to take an intelligent interest in the wide range of procedures which she is likely to see carried out in the operating theatre. There are some 50 line drawings to help her to visualize many technical details that might otherwise have been overlooked. It is not meant to be a practical guide for the theatre nurse and does not therefore contain lists of the instruments used, but it is a good introduction to operative surgery. Nurses can certainly turn to it with every confidence.

The second volume—*101 Clinical Demonstrations to Nurses*, by Hamilton Bailey—follows the lines of his similar book for medical students and consists of photographs of typical cases of well-known diseases with a brief description of the main features illustrated. The photographs, some of which are in colour, are well chosen and the reproduction is satisfactory. They cannot fail to convey to the nurse a clear impression of some of the common diseases met with in her work.

Notes on Books

The Nursery School Association of Great Britain has issued a pamphlet on *Planning the New Nursery Schools* (University of London Press, Malham House, Bickley, Kent; 2s. 6d.), which owes its origin to a special committee. It is full of useful information, but would have been even more valuable if the committee had included in its membership an experienced school medical officer or a physician with expert knowledge of the young child in health and disease.

Dr. DONALD PATERSON'S *Sick Children: Diagnosis and Treatment* (Cassell and Co., Ltd.; 16s.) has enlarged its shape and size for a fifth edition, and this indicates the completeness of the revision. New matter on penicillin, the rhesus factor, coeliac disease, and epidemic jaundice is included, and many other sections, including that on gastro-enteritis, have been revised.

Preparations and Appliances

A LIGHT "WELL-LEG" TRACTION SPLINT

Major A. C. BREWER, F.R.C.S., R.A.M.C., writes:

Battle casualties with fracture of the upper third of the femur are notoriously difficult to treat in the field. The present "Tobruk plaster splint" is by no means ideal, and a spica is not only difficult to apply without special apparatus but also unsatisfactory for travel. A wound which is high in the thigh makes it difficult to apply the fully ringed Thomas splint necessary to the "Tobruk" method. It is essential that the patient in a Tobruk plaster should reach a satisfactory base within ten days owing to the incomplete reduction and fixation of the fracture. To overcome these several disadvantages the following appliance is described.

Description.—Two half Thomas rings are joined together 8 in. from their axes into a simple rod. The material used is 1/4 in. round metal as in the Thomas splint. The rod is

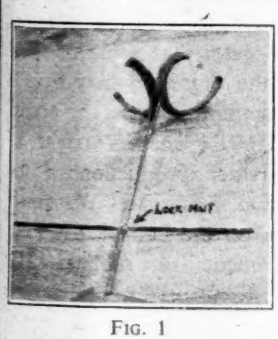


FIG. 1

FIG. 2

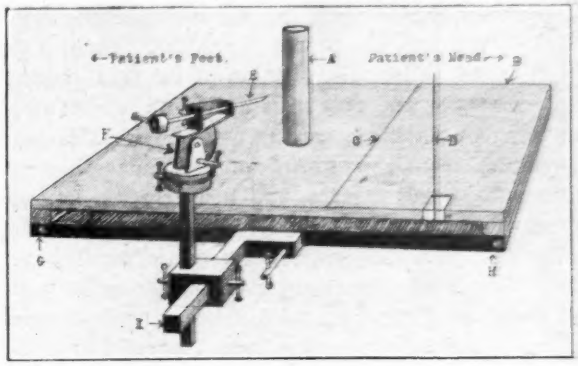
flattened and notched from a distance of 22 to 40 in. A cross-bar fits on the primary rod and is secured in place by a simple wing-nut (see Fig. 1). The whole weighs 3¾ lb., as distinct from 5 lb. for the Thomas splint.

Method of Application.—The wound is dealt with on general principles. Both legs are then placed in padded plaster below the level of the knee. The feet are secured to the crossbar with plaster. Traction to reduce the fracture is applied to the crossbar, the "well leg" giving the required length. The lock-nut is screwed tight. Wool padding is applied around the thigh on the injured side and the plaster completed well up to the groin. The knee is slightly flexed by the assistant as the plaster hardens. A pillow is placed beneath the knee of the "well leg." Fig. 2 shows the appliance on a patient with a fracture of the mid-femoral shaft. It will be noted that the patient can easily sit up in the appliance. For transportation the splint crossbar is secured to the stretcher bar by means of a few plaster turns.

MECHANICAL JIG FOR ACCURATE INSERTION OF SMITH-PETERSEN NAILS

Mr. G. S. STORRS, F.R.C.S., surgeon to the Fracture Clinic, Bedford County Hospital, writes:

The apparatus clamps on to an orthopaedic table (Shropshire horse) and provides a perineal post (A), a buttock support (B), and a drawer which slides beneath B to enable antero-posterior films to be slid under the patient. The stainless-steel parts make up into the guide proper and can be fixed on to either side of the support. The head-piece (F) is adjustable in two planes, horizontal rotation and vertical tilt, and each



adjustment is calibrated in degrees. A chisel-pointed guide wire sheath (E) slides through the head-piece. The head-piece can be raised or lowered, slid inwards or outwards along the projecting arm of the L-piece (I), or moved longitudinally by sliding the L-piece between the points G and H. Winged bolts will lock all the adjustments.

Technique.—The anaesthetized patient is put in position on the support, the fracture reduced, and the legs fixed to the traction bars of the table in abduction and internal rotation. Six dental needles (as skin markers) are inserted in a double row 1 in. apart parallel to the outer border of the shaft of the femur below the greater trochanter. Using two *x*-ray units antero-posterior and lateral films are taken. The line for insertion of the nail is marked on the films joining the centre of the head of the femur to the head of the best-situated dental needle. The angle of insertion is measured in both films, using the shadow of the transverse wire (C) in the antero-posterior film and of the vertical wire attachment (D) in the lateral film as base lines from which the angles are measured.

The stainless-steel parts are boiled and the head-piece is set to correspond with the two measured angles. The head-piece is then aimed at the selected dental needle and all locking bolts are tightened. A small incision is made and the guide-wire sheath is slid through the head-piece and pushed through the muscles and its point impacted into the cortical bone with a tap with a hammer and the sheath is locked in the head-piece, when it will be found to be perfectly rigid. A long 2.5 mm. guide-wire is inserted through the sheath and drilled into the bone. Antero-posterior and lateral films will show the wire in correct position in the bone, and the operation is completed in the usual manner.

It is claimed that the instrument is highly accurate, thanks to sound mechanical construction. It is in fact a precision tool. I am extremely grateful to a local engineering firm for the excellent construction of the apparatus to my designs and for presenting it to the Bedford County Hospital, where I have used it most successfully for the insertion of more than 24 nails.

British Schering Ltd. announce that after having been unobtainable for rather more than three years, "Uroselectan B," the original iodoxyl contrast medium in intravenous pyelography, is again in full supply. This product, formerly German-owned and made in Germany, is now British-owned and made in England.

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TRINITROTOLUENE

Trinitrotoluene, which is the symmetrical trinitro derivative of toluene, was first made in the laboratory by the German chemist Hepp in 1880, and was first put to use as an explosive by the Germans in 1902. We can group explosive charges broadly into three divisions: initiators or detonators, of which the two most important are mercury fulminate and lead azide; intermediates, for which tetryl is usually used; and the main explosive charge, for which, until recently, a T.N.T. mixture was always employed. Contact with T.N.T. causes yellow discoloration of the skin, nails, and hair; its vapour and dust irritate the mucous membranes and bring on sneezing, sore throat, and irritable cough. Dermatoses include a superficial erythema which may become thickened, papules, and itchy eczema (especially in uncovered parts of the body); vesicles may sometimes be formed. Skin rashes are commoner in women than in men. Gastro-intestinal symptoms include pain, nausea, vomiting, loss of appetite, and diarrhoea; tenderness below the right costal margin has been thought to indicate involvement of the liver. The most serious sequels of T.N.T. poisoning are jaundice and toxic hepatitis, which may end in yellow atrophy of the liver; they have a mortality rate of 25 to 30%. The most conspicuous findings in T.N.T. anaemia are reduction of the red blood cells and of the haemoglobin, which may be associated with fragmentation of the red blood cell, stippled cells, reticulocytosis, and eosinophilia. Relative lymphocytosis appears to be the most common change of the white blood cell picture. Cyanosis of the lips and ears, frequent in cold weather, may be due in part to the formation of a chromogenic pigment derived from T.N.T. and in part to the formation of methaemoglobin and sulphaemoglobin. Effects on the nervous system largely result from anoxia and consist of dizziness, headache, fatigue, and sleepiness, but in severe cases may include delirium, convulsions, and coma. Signs of peripheral neuritis and pain in certain muscle groups are not infrequent. Vasomotor irregularities, palpitation, oppression in the chest, and bradycardia have been reported, as well as urinary symptoms such as lumbar pain, urgency of micturition, albumin, and casts. In women menstrual irregularities occur.

At first T.N.T. was thought to be a non-toxic substance, and Prosser White[1] showed that dinitrobenzene was more toxic to animals; but in the last war the first fatal case occurred as early as February, 1915. So many workers were poisoned that on January 1, 1915, toxic jaundice was made a notifiable disease; as a result 181 cases with 52 deaths were notified in 1916 and 189 cases with 44 deaths in 1917; the greater knowledge of the danger and the introduction of preventive measures reduced the notifications in 1918 to 34 cases with 10 deaths. In the same period there were 15 fatal cases of aplastic anaemia. Similar observations were made in Germany and the U.S.A. Koelsch[2] concluded that pure, recrystallized T.N.T. does not possess the toxic properties of the crude material, that serious toxic effects from fairly pure material are exceptional, and that the degree of contamination was the decisive toxicological factor. Voegtlin and his co-workers in the field of experimental pathology[3] observed that susceptibility varied in different animals, guinea-pigs and rabbits being less sensitive than cats and dogs. In England the Medical Research Council promoted much work, as a result of which Moore[4] thought that the usual route of absorption was through the skin; Webster[5] developed a valuable chemical test for demonstrating the presence of T.N.T. derivatives in the urine, and Panton[6] showed that toxic jaundice and anaemia appeared to be separate pathological states. Anaemia might occur without jaundice, while only 17% of the jaundiced patients became anaemic.

During the present war only 99 cases of toxic jaundice, of which 23 were fatal, had been notified up to the end of 1943, while nine cases of toxic anaemia had occurred before February, 1942. It seems certain that this smaller incidence is not entirely due to preventive measures, although these have been most efficiently carried out. The lower incidence of toxic manifestations after the installation of exhaust ventilation confirms the view of Von Oettingen[7] that the principal portal of entry is through the lungs and not the skin, as was thought by Moore. Our relative freedom from serious trouble in the present war may be due to the improved manufacturing methods of to-day, which produce a T.N.T. practically free from isomers, whereas in the last war these were present in considerable quantities. Improved diet may also have played a part. Himsworth and Glynn[8] showed that rats treated with α-T.N.T. and fed on a high-fat diet developed necrosis of the liver; while ill effects were slight or absent in animals fed on a high-carbohydrate or a high-protein diet. Himsworth[9] has suggested that T.N.T. combines with amino-acids, forming a combination which cannot be used by the body; thus a state of conditioned amino-acid deficiency may arise, and in such a state the liver may be damaged. Von Oettingen[7] was unable to injure the liver in experimental animals. Different animals metabolize T.N.T. through different chemical derivatives, and he suggests that some of these amino derivatives produced in the organism may have a more injurious effect on the liver than others. The occurrence of toxic hepatitis in T.N.T. workers might be explained on a basis of a greater production of the more toxic metabolites. Channon, Mills, and Williams[10] attempted to obtain information on the fate of T.N.T. in the body by means of experiments on rabbits. The

1 *Lancet*, 1901, **2**, 582, 769.

2 *Zbl. Gewerbehyg.*, 1918, **6**, 15, 26, 53, 66, 88.
3 *Publ. Hlth. Rep. Wash.*, 1919, **34**, 1307; *Hyg. Lab. Bull.*, 1920, No. 126, Washington; *J. industr. Hyg.*, 1921, **3**, 239, 280.
4 Spec. Rep. Ser. M.R.C., 1917, No. 11.
5 *Lancet*, 1916, **2**, 1029; Spec. Rep. Ser. M.R.C., 1921, No. 58.
6 Ibid., 1917, **2**, 77.
7 *U.S. publ. Hlth. Bull.*, 1944, No. 285, Washington.
8 *Clin. Sci.*, 1942, **4**, 421.
9 *Proc. roy. Soc. Med.*, 1945, **38**, 101.
10 *Biochem. J.*, 1944, **38**, 70.

presence in the urine of animals fed on α-T.N.T. of 2:6 dinitro-4-hydroxylaminotoluene, 2:6 dinitro-4-aminotoluene, and 2:4 dinitro-6-aminotoluene (which may be estimated accurately by spectrophotometric methods[7]) points to some reduction mechanism. T.N.T. may also be oxidized: experiments with trinitrobenzyl alcohol in attempts to establish the origin of the red pigment indicate the probable existence of such a mechanism, since only α-T.N.T. and 2:4:6 trinitrobenzyl alcohol would cause excretion of red pigment. Present knowledge of detoxication mechanisms suggests that the glucuronides of T.N.T. urine must arise from T.N.T. oxidation products. they are probably trinitrobenzyl glucuronide, or dinitroaminobenzyl glucuronide, or a mixture of both. The hydroxylamine derivative provides an example of the making of a more toxic product in a detoxication mechanism, and it is a powerful former of methaemoglobin *in vitro*. Since the first stage in the biological reduction of T.N.T. is the formation of dinitrohydroxylaminotoluene, there is produced a very reactive compound which may be harmful to the blood and may poison some of the enzyme systems. The hydroxylamine can be detoxicated by conversion into the relatively non-toxic dinitroaminotoluenes, and its poisonous effects will depend on the rate at which this conversion occurs. Although the conversion takes place *in vivo* it is by no means complete, for the hydroxylamino and the amino compounds are excreted in the urine in roughly similar amounts. The formation of dinitrohydroxylaminotoluene may therefore partly explain the toxic action of T.N.T. Doses of T.N.T. up to 150 mg./kg. are eliminated in 24 hours; larger doses require up to 48 hours; 47% of the T.N.T. administered is excreted as glucuronides and 30% as aromatic amino compounds. The aromatic amino compounds include not only dinitroaminotoluenes but possibly dinitroaminobenzyl alcohol conjugated with glucuronic acid. Trinitrobenzylglucuronide is also a likely constituent. The red 2:2′:6:6′-tetranitro-4′:4-azoxytoluene isolated by previous workers is not a metabolic product; it is absent from freshly voided urine and is formed from dinitrohydroxylaminotoluene during the extraction procedures. Rimington and Goldblatt[11] have shown that workers handling aromatic nitro and amido compounds have a greatly increased urinary coproporphyrin excretion, and this change is also found in T.N.T. workers.

Little clinical work has been possible on T.N.T. poisoning during the present war, but during the Russo-Finnish war Noro[12] observed that in Finnish T.N.T. workers reticulocytosis was not very great during the period of actual exposure, but that it became more evident when the worker left contact with T.N.T.; this suggests that reticulocytosis was a reparative phenomenon which is to some extent inhibited by T.N.T. In order to establish the early effects of exposure to T.N.T. Higgins, O'Brien, Stewart, and Witts[13] examined a number of Oxford students who volunteered to work in a filling factory during their vacation. The chief subjective complaints were nausea with variable loss of appetite, diffuse abdominal pain, vomiting and diarrhoea, fatigue, and irritation of nose and throat. The symptoms came on after an initial period when there was an increased sense of well-being accompanied by a voracious appetite. There was evidence of haemolysis in over 85% of the students, with a fall in haemoglobin, red cell, and haematocrit readings. There were also an increase in reticulocytes, bilirubinaemia with urobilinuria, and a marked erythroblastic response in the marrow. As Noro found, the reticulocyte response was not maximal until a few days after exposure had ceased. This suggests that T.N.T., in addition to a destructive action on the circulating red cells, also affects the bone marrow.

[11] *Lancet*, 1940, **1**, 73.
[12] *Acta med. scand.*, 1941, Suppl. No. 120.
[13] *Brit. J. industr. Med.*, 1945, **2** (in the press).

GAMMA GLOBULIN

The story of how human blood has been harnessed to the war effort will prove to be among the most fascinating tales of our generation. In the early days of the war blood banks and improved methods for the preservation of whole blood were successfully established. Then, with the emphasis on shock, harvesting of the plasma proteins became important, and large-scale methods of freezing and drying plasma and serum were evolved. Meanwhile in America before the war, but accelerated by the war, methods for the fractionation of the plasma proteins were being steadily developed in the department of physical chemistry at Harvard under the direction of Prof. E. J. Cohn. The methods themselves were revolutionary in their utilization of new physical and chemical processes: high-speed centrifugation, electrophoresis, diffusion, viscosity, and precipitation at iso-electric charges have all been used for the separation of different protein fractions with the least possible damage to the constituents. The story has lately been summarized by Cohn[1] himself, while various chemical, immunological, and clinical aspects are described in a special symposium[2] on the subject.

Plasma has been conveniently divided into five fractions: I is largely fibrinogen; II and III contain gamma globulin, the iso-haemagglutinins and Rh antibodies, and prothrombin; IV is mostly alpha and beta globulin; and V is albumin, which constitutes nearly 60% of the total proteins. Indeed, the fractionation of plasma on a large scale was first undertaken in order to obtain the albumin in concentrated form for the treatment of shock. Having a small, fairly regular molecule, albumin contributes 80% of the osmotic pressure of plasma proteins and can be prepared as an iso-viscous 25% solution which osmotically is four times as concentrated as plasma. Besides its value in shock, concentrated albumin may be used in the treatment of hypoproteinaemia, oedema, and (because of its low salt content) as a diuretic. Of the other proteins thrombin supplied in a matrix of fibrin, called fibrin foam, has been used as a haemostatic in neurosurgery and in controlling bleeding from oozing surfaces and in haemophilia. Being composed entirely of human proteins, fibrin foam is absorbed with the minimum of reaction. Again, fibrinogen has been worked up like a plastic to prepare fibrin films which, with the properties of a rubbery sheet,

[1] *Science*, 1945, **101**, 51.
[2] *J. clin. Invest.*, 1944, **23**, 417 *et seq.*

have been used as dural substitutes and in the prevention of meningo-cerebral adhesions.

Probably the most important derivative of plasma will be the gamma globulin, which contains a large part of the natural antibodies of the blood. Gamma globulin constitutes about 11% of the plasma proteins, and the greater part of this globulin has now been fractionated in practically pure form from the combined II + III fraction. The concentration of antibody as judged by the estimation of the diphtheria and streptococcus antitoxin and influenza virus A antibody is 15 to 20 times that of the natural pooled plasma, and its content of certain antibodies equals or exceeds that of convalescent serum. There has been remarkable uniformity in the potency of different pools from various regions of America. Gamma globulin has already been used on a large scale for the prevention and attenuation of measles in familial contacts and in institutions; analyses indicate that a dose of 2.0 to 2.5 c.cm. will protect 80% of young, susceptible, and intimately exposed children, with marked attenuation in the remainder. Where attenuation only is desired the recommended dosage is around 0.5 c.cm. In other words, results equal to those obtainable with convalescent measles serum have been achieved with one-quarter to one-half the dosage of that rather rare commodity. Although the gamma globulin now issued cannot be used intravenously, progress has been made with the removal of the depressor substance which precludes intravenous therapy, and it seems likely that such a preparation will be useful for the treatment of early cases of measles and other infections. Meanwhile there are other obvious fields for its prophylactic use. Thus Stokes and Neefe[3] tried it in summer camps for boys and girls where a widespread epidemic of infectious hepatitis was occurring, with reasonable hopes of success since the incubation period is long and the infecting agent is presumably present in the blood during the pre-icteric stage of the disease. Among 29 boys injected with doses equal to 0.15 c.cm. per kilo of body weight, 4 (13.3%) developed hepatitis without jaundice, whereas among 130 controls 90 (69%) became infected, and two-thirds of them had jaundice. Of the inoculated girls 3 out of 16 (18.7%) developed hepatitis with scleral jaundice only, while 82 of 116 controls (70%) became infected. The better results obtained among the boys were attributed to the injections being given earlier in the incubation period in that group. The authors remarked on the apparent absence of the "hepatitis agent" in gamma globulin used for large-scale prophylaxis of measles, and this finding, if corroborated, may be another argument for the fractionation of human plasma. Further clinical experience and improvements in the methods of assay will show whether gamma globulin will be useful for the prophylaxis of other virus and bacterial infections—e.g., chicken-pox, mumps, pertussis. Some of the natural antibodies seem to be concentrated in other fractions. However, the proven value of this derivative of human blood will act as an incentive to blood donors to carry on into civilian life the magnificent work they have done in response to the demands of war. It is to be hoped that our chemists and biophysicists will soon be given opportunities to develop this new field.

[3] *J. Amer. med. Ass.*, 1945, **127**, 144.

FOOD CONTROL

The long controversy over preservatives in food ended with the passing of the Public Health (Preservatives, etc., in Food) Regulations of 1925. Many experts had advocated that the use of particular preservatives should be forbidden, but the Ministry of Health adopted in these regulations the much sounder plan that all preservatives (except the common types like sugar or vinegar) should be prohibited except those specifically permitted for indicated foods and only in amounts which must not be exceeded. It was never suggested that the last word had been said, but the principle was established that nothing might be added unless specifically authorized and under defined conditions as to the preservative to use, its quantity, and the food to be preserved. Under war conditions the conserving of food supplies became urgent, and the central authorities concerned—i.e., the Ministries of Health and of Food—had to face the question of relaxing certain requirements if it could be shown that it favoured the conserving of more food and was not harmful to the consumer. Obviously such decisions are not easy, involve the balancing of various opposing factors, and demand an intimate knowledge of the conditions of food preparation and preservation. This need accounts for the rather bewildering number of Orders that have been issued—some allowing certain relaxations, others cancelling relaxations previously permitted. One of the latest is Regulation 60 CAA of the Defence (General) Regulations, 1939, and is a good illustration of the way in which preservatives are being controlled. It allows oranges to be imported in wrappers treated with diphenyl; meat and dehydrated vegetables may contain sulphur dioxide, and margarine and bacon borax; jam may contain more sulphur dioxide than in the original Regulations—i.e., up to 100 parts per million. Two sections of the Order relax certain requirements of the Public Health (Condensed Milk) Regulations, 1923, and there are requirements as to preserved eggs and their markings.

While the changes are not in themselves of much importance, this new Regulation illustrates very well the complexities of food production, preservation, and sale under modern conditions. These various Orders will no doubt be revoked or amended when the war is over, but the need for food control will still remain. Many people clamour for the removal of control and for unrestricted freedom. But food conditions are so complicated that if all controls were removed the state of affairs would be chaotic. The Ministry of Food, being wise enough to obtain and use expert advice, has done a sound bit of work not only in feeding the people but in improving the qualitative dietary of all. Some of this work, such as school meals, school milk, special foods for babies and expectant mothers, should continue; there is also a need for scientific control over food production and conservation. In these fields we now have a volume of accurate knowledge, which, however, needs scientific application and some measure of control.

A FLUORESCENT GUIDE TO LOCAL CIRCULATION

The diagnosis and still more the prognosis of peripheral vascular disease is a complicated matter which needs the accurate plotting of skin temperatures, oscillometric determinations, and often arteriography after injection of thorotrast or other *x*-ray-opaque solution, and the effects of blockage of the sympathetic innervation or of intermittent venous occlusion. A relatively simple method which gives a direct insight into the nutrition of the tissues is therefore welcome, especially when it has been thoroughly tested in over 1,000 patients without untoward reactions. A 5%

fluorescein solution is injected intravenously, and its arrival in the tissues under examination demonstrated by its fluorescence under ultra-violet rays. Fluorescein absorbs the invisible ultra-violet and converts it instantaneously into a visible yellow-green light; the method thus requires only a dark room and a mercury-vapour lamp with an appropriate filter to give an ultra-violet beam of wave-length 3,600 Ä.U., at which fluorescein shows its maximum fluorescence. The lamp can be directed on to any part of the patient, and the fluorescence of suspected areas of deficient circulation can be rapidly compared with the normal. In the common type of diabetic gangrene, for example, there is a marked decrease in fluorescence of both limbs and an entirely non-fluorescent distal gangrenous area, indicating that amputation should be done at a high level; but in a second type the general fluorescence of the limb is almost normal, and around the area of gangrene there is a zone of hyperfluorescence, indicating a vascular demarcation reaction of the surrounding tissue which will prevent further spread of the gangrene, so that amputation is not required. The hyperfluorescence is mainly due to increased capillary permeability, and it is thus possible to distinguish the reddish-blue discoloration of a foot due to commencing inflammation (incipient gangrene) from that due to stasis—the former being *hyper*fluorescent, and the latter *hypo*-fluorescent. In acute embolism the test permits the exact establishment of the level of blood supply in the skin and how far a procaine block of the sympathetic chain will improve the collateral circulation. In two of Lange and Boyd's cases[1] they were able to show that the embolus, though it had caused coldness and blanching, had not led to complete vascular occlusion, since the tips of all toes were fluorescent; and the subsequent clinical course bore out their contention that gangrene would not occur. The test is valuable in establishing an immediate prognosis of frostbite, and it will show in chronic ulcers whether skin grafts will "take."[2] For studies of capillary permeability and for physiological rather than pathological investigations Lange and Krewer[3] have introduced a refinement by which the amount of fluorescence can be objectively determined, and their "dermofluorometer" is essential in the examination of coloured people, since skin pigmentation interferes with visual observation of the fluorescence.

CLINICAL EFFECTS OF VIBRATING TOOLS

Pneumatic tools were first used in the French mines as early as 1839; now they are used extensively in many industries: in shipbuilding for riveting and caulking, in foundries for fettling, in road-making and stone quarries, and in scaling boilers. The to-and-fro motion of these tools can also be converted to a rotary one, and they can be used as drills. Similar tools are made in which the power is generated by electric or other kinds of motor instead of by compressed air. Vibrating tools have been reported as giving rise to several clinical syndromes—white fingers; arthritis of wrist, elbows, and shoulders; the formation of areas of decalcification in the bones of the carpus; and injuries of the palmar aponeurosis and the ulnar nerve. Arthritis has mostly been found in miners in the Northern French, Belgian, Rhineland, and Westphalian mines,[4 5] where a heavy tool is used. In England pneumatic tools are rarely used in the mines, but Hunter, McLaughlin, and Perry[6] in a recent survey found little evidence of arthritis in riveters, caulkers, or fettlers, though they found six cases of arthritis of elbow among twelve scalers. These figures are small, and no conclusions should be drawn from them until more scalers have been examined. Dupuytren's contracture and ulnar paresis can undoubtedly result from the pressure of these tools on the palm of the hand, but such occurrences are rare. Large bruises are commonly found on the back of the hands of riveters who work on the under side of ships; they are caused by the hand being constantly knocked against the knee when the tool is used in an inverted position. Brailsford[7] found on *x*-ray examination small areas of decalcification in the bones of the carpus of pneumatic-tool workers, and confirmation of this has been given by McLaren.[8] Such areas are probably due to repeated trauma and not to the vibration of the vibrating tools. They certainly occur in men who have never used these tools; but an investigation is needed to find out how frequent are these decalcified areas in the carpus in the general population. Hunter, McLaughlin, and Perry[6] found them most frequently in "holders up," 18 out of 28; whereas in the users of vibrating tools they occurred in 45 out of 78 riveters, 18 of 36 caulkers, and 51 of 108 fettlers.

The most important of the syndromes from which these workers suffer is a vascular disturbance which produces a local anaemia in the fingers, making them stiff and awkward; and in severe cases the symptoms may prevent the men from working or cause them to seek other employment. Maria Seyring[9] in Germany reported that 92 out of 189 fettlers complained of white fingers; 61% of the men who had been on the work for more than 10 years had the syndrome. It occurs mostly in the left hand in right-handed workers and in the right hand in left-handed workers. The hand which holds the tool bears the brunt of the vibration, and Hunt[10] suggested that this vibration was the fundamental cause of the trouble. He emphasized that the body and handle of the tool vibrate less than the striking end. Cold is undoubtedly a precipitating factor, but the striking end of the tool is always hot from friction, and the cold air escapes through the exhaust, which is directed away from the man's hand. Hunter, McLaughlin, and Perry[6] found the condition in 74% of men who used tools with a stroke speed between 2,000 and 3,000 a minute, and they thought this was a critical frequency; but they pointed out that these men also worked with cold metal—they were caulkers and fettlers. Riveters, who use tools with a vibration speed under 2,000, drive red-hot rivets; the syndrome was present in 23 out of 43 cases. The symptoms are not accompanied by constitutional changes which would prevent a man attending at his place of work. There is, nevertheless, a disability which will stop him working until the circulation returns to his hand; and when the syndrome of white fingers has been established it tends to recur on exposure to cold for some years after the worker has given up the use of vibrating tools. Junghans[11] demonstrated arteriovenous thrombosis histologically, and Barker and Hines[12] by means of thorotrast have shown obstruction to the ulnar artery; but only two cases[13 14] of gangrene of the fingers are mentioned in the literature.

[1] *Arch. intern. Med.*, 1944, **74**, 175.
[2] Lange, K., *Surgery*, 1944, **15**, 85.
[3] *J. Lab. clin. Med.*, 1943, **28**, 1746.
[4] Holtzmann, F., *Zbl. Gewerbehyg.*, 1926, **13**, 23[5].
[5] Rostock, P., *Mschr. Unfallh.*, 1934, **41**, 73; *Med. Klinik*, 1936, **32**, 341.
[6] *Brit. J. industr. Med.*, 1945, **2**, 10.
[7] *British Medical Journal*, 1936, **2**, 657.
[8] *Lancet*, 1937, **2**, 1296.
[9] *Arch. Gewerbepath. Hyg.*, 1930, **1**, 359.
[10] *Quart. J. Med.*, 1936, n.s. **5**, 399.
[11] *Arch. klin. Chir.*, 1937, **188**, 466.
[12] *Proc. Mayo Clin.*, 1944, **19**, 345.
[13] Teleky, L., 1938. Occupational and Health Supplement, No. 2, Geneva.
[14] Bennett, G. A., Waine, H., Bauer, W., 1942. *Changes in the Knee-joint at Various Ages*. Commonwealth Fund, New York, 68.

The Moynihan Lecture for 1944 (delayed on account of the exigencies of military service) will be given on Thursday, June 7, at 3 p.m. in the Riley Smith Hall of the University Union, Leeds, by Brig. J. A. MacFarlane, M.B.Toronto, F.R.C.S. (Hon.), F.R.C.S.Ed., Consulting Surgeon, Canadian Army Overseas. Subject: "The Management and Results of War Wounds of the Abdomen, 1944." Members of the medical profession are cordially invited to be present.

THE EPIDEMIC OUTLOOK IN EUROPE*

BY

KNUD STOWMAN, M.D.

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During the more than five years of destruction and privation, accompanied by forcible or voluntary displacement of a large fraction of a populous continent's inhabitants, there has been no pandemic of first magnitude. Gratifying though this is, the fact must not be taken to mean that the epidemic situation is as satisfactory as it was before the war, nor as indicating a favourable outlook for the first years of transition to stable peace. The absence of real disasters may be traced to the low endemic level of most diseases during the years preceding the war, in conjunction with the advance of preventive medicine and the application of its principles on a large scale. On the other hand, caution against over-optimism is dictated by the disastrous aftermath of World War I.

During the four years of World War I Europe witnessed a rise in the endemic level of infectious diseases, and there were various pestilential outbreaks, such as that of cholera in Galicia in 1915, which caused over 17,000 deaths. A devastating typhus epidemic broke out in Serbia in 1915, causing 150,000 deaths in six months, and there were severe typhus epidemics in Egypt. Moreover, typhus caused several hundred thousand deaths in Rumania during the winter of 1917–18. There were extensive smallpox epidemics in various countries. Nevertheless, it was after the cessation of hostilities and following the disintegration of established government over wide areas that typhus, relapsing fever, cholera, malaria, dysentery, and typhoid fever swept across Eastern Europe, leaving millions of victims, and made serious inroads also in Southern and Central Europe. Whether directly due to conditions of war or not, it was at the time of the Armistice that the influenza pandemic struck, causing in less than half a year twenty million deaths throughout the world.

With World War II entering its final stage, civil administration is now in a fluid state in many areas and refugee movements are gathering momentum. These conditions, propitious to the propagation of epidemics, are likely to grow worse during the current year. They will further complicate the return to their native countries of millions of prisoners of war, shanghaied labourers, forcibly displaced people, and other uprooted men, women, and children, in themselves constituting grave potentialities so far as epidemics are concerned.

Appreciation of the problems at hand may be based on: (1) the trend of epidemic diseases in recent years in areas for which fairly accurate epidemiological data are available; (2) fragmentary information regarding the areas where no precise records of recent date exist; and (3) various estimates of displaced persons. The last-mentioned problem, which has other angles than the epidemiological, will not be dealt with in this summary.

Recent Trend of Epidemic Diseases

It may be said at once that among the five pestilential diseases covered by the International Sanitary Conventions only louse-borne typhus presents an immediate and grave danger to Europe. *Cholera*, which is a serious problem in Asia, has not appeared within recent years west of India and Afghanistan. *Yellow fever* seems hardly to have spread during the war, and has not been observed north of the North African desert belt. It should be added, moreover, that had no precautions been taken, the extension of these diseases would probably have been different.

Plague.—So far as we know, plague has not been introduced into any European port during the war. Nevertheless, this may happen at any time, as it did after World War I, because several large ports in North Africa and the Near East have become infected. The most important near-by foci are in the Suez Canal zone and at Dakar. Although they are quiescent at present on account of the season, these foci may flare up again. Meanwhile infection has spread to other ports, such as Haifa and Jaffa in Palestine, Ferryville in Tunis, Algiers and Oran in Algeria. The old plague centres in Morocco, especially at Casablanca, and in the Azores have also shown renewed activity in recent years. The outbreak in the Suez Canal zone from Nov., 1943, to Sept., 1944, was the worst on record, 712 cases being reported, as against 359 in 1917. There were over 500 plague cases at Dakar in 1944, which is equal to the number notified in 1931, the worst year since 1920.

Smallpox.—Europe has remained practically free from smallpox during the war except for the 1944 outbreak in Sicily and Southern Italy, and an extension of the Near East epidemic into European Turkey and the neighbouring parts of Greece. The latter epidemic, which was of the classical type, has now come to an end. The Italian epidemic, the first case of which appeared in March, 1944, has centred at Palermo and at Naples and the vicinity. Although there have been some 1,500 cases all told, the epidemic is apparently not of prime importance, because all cases have been of the mild type. Only six deaths were reported, all among debilitated children. In this connexion it may be of interest that mild-type smallpox seems to have gained ground in French North Africa, while the classical type still prevails in the Near East. In the Iberian Peninsula, where smallpox was widespread during the early years of the war, there are now only sporadic cases of variola minor. The most encouraging element in the whole epidemic situation is that there were only 3 cases of smallpox in 1944 (7 cases in 1943) among the more than 200 million inhabitants of Continental Europe outside the Soviet Union and the Mediterranean peninsular areas. In 1919 there were nearly 50,000 cases of smallpox in this area.

Typhus.—Typhus presents a far greater danger than smallpox. In certain areas severe epidemics are already under way, and in much larger areas the danger is potential because for several years there has been an insidious spread of sporadic infection throughout Central Europe. It should also be remembered that North Africa and the Near East are just emerging from an epidemic wave extending from Morocco to Iran, which has been among the worst on record in several of the countries. The Soviet Union was the principal sufferer from typhus after World War I, but has apparently succeeded in keeping this disease under close control during the present conflict. The publication of records was discontinued, however, a couple of years before the outbreak of the war. In Poland typhus is known to have been on the increase during the German occupation, but numerical indications are not available for the last four years.

There are three main epidemic foci of typhus in South-Eastern Europe: the Rumanian, with centre in Bessarabia and Eastern Moldavia; the Sub-Carpathian, with centre in Sub-Carpathian Ruthenia and extending into North-Eastern Hungary; the Croatian, with centre in Bosnia and probably extending into Serbia. All of these foci were in rapid evolution in the spring of last year, and there was a serious epidemic in Croatia and Bosnia, extending late into the summer. Information for recent winter months is not available for the Sub-Carpathian area. An epidemic reminiscent of the World War I disaster has broken out in Rumania. Unofficial information gives 30,000 cases in Moldavia alone, and the epidemic is likely to increase up to April or May. So far, this is undoubtedly the most serious epidemic outburst of any disease during the war. In recent years the epidemic level has been rising also in Bulgaria and Greece, and typhus was epidemic in Turkey in 1943. On the other hand, the typhus epidemic which visited Spain in 1941 and 1942, causing over 11,000 cases, has now been reduced to an endemic level. The outbreak in and around Naples during the winter of 1943–4 (somewhat over 1,000 cases all told) was brought under control in the course of a few months, and at present there is hardly any typhus in Italy. In Germany, where typhus was formerly unknown, there were over 5,000 cases in 1943, mostly among foreign workers. The cases were spread over the entire area of the Reich as far west as the Rhineland. Information for recent months is not available, but present conditions obviously favour the spread of infection. The typhus-free area of the European continent now consists only of the three Scandinavian countries, Finland, Switzerland, and, aside from relatively rare sporadic cases, the Netherlands, Belgium, and France.

With the exception of an outbreak in Tunis in March and April, 1944, and the tick-borne cases in Spain, *relapsing fever*, which followed on the great typhus epidemics of 1919–21, has not been heard from during the present war.

The above-mentioned diseases specially dealt with by the Sanitary Conventions—namely, cholera, yellow fever, plague, smallpox, and typhus—are international quarantine diseases not merely because they are the most dangerous, but also because they are of limited geographical extension and their introduction into uninfected areas is consequently feared. Various other epidemic diseases, such as typhoid fever, diphtheria, scarlet fever, and influenza, are numerically more important in Europe, but they are normally endemic in all countries. International transmission thus becomes of importance only when they develop particularly virulent strains locally or attain an unusually high incidence.

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Increase in Incidence of Common Infectious Diseases

Apart from the menace of typhus, the most significant fact of the epidemic situation is that the incidence of all the common infectious diseases has doubled or trebled in that part of the European continent for which statistics are available, and this means chiefly among the resident population of the less desperately afflicted countries. The table below, which covers mainly Central, Northern, and Western Europe, is based on the regular official returns of 12 countries where the public health services have never ceased to function and where the statistics may be considered reasonably accurate. Returns for 1943 have been used because the 1944 data are not yet complete. The pre-war data employed for comparison cover a period sufficient to include unfavourable years.

Cases of Certain Epidemic Diseases Reported in 12 Continental European Countries

	Median, 1928–38	Cases, 1943	1943 Incidence in Units of Pre-war Level
Cerebrospinal meningitis (in 15 countries)	2,561	7,996	3·1
Poliomyelitis	4,546	11,292	2·5
Typhoid fever	28,681	44,316	1·5
Dysentery (in 8 countries) ..	10,965	23,110	2·1
Diphtheria	168,354	501,911	3·0
Scarlet fever	176,275	566,398	3·2

The significant fact brought out by the above table is that there has been a heavy increase in the incidence of not merely some but all these diseases. It is unusual that entirely unrelated diseases should reach a peak during the same year and on a whole continent. The increase has probably been even greater than shown, because reporting is likely to have deteriorated in most countries, fewer physicians being available to notify civilian cases than in peacetime. Furthermore, there are excluded from the statistics the huge number of men in the armed Forces and, in several countries, also certain categories of non-resident population. There is thus a greatly increased amount of infection of all kinds, which doubtless results also in an increased ratio of carriers. It is in this polluted atmosphere that the war will have to be wound up.

Typhoid.—Efforts to control typhoid fever have been partly successful, and the increase of this disease has been the least spectacular among those shown in the table. However, the table does not include Italy, which in 1942 was responsible for one-half of the typhoid fever cases reported in all of Europe outside the U.S.S.R. and the Iberian Peninsula. The rate of increase is further lowered by the returns for Hungary, where the pre-war level has been maintained by systematic vaccination. In other Central European countries the incidence of typhoid fever has doubled, and in France it has almost trebled. Typhoid fever remains as rare in the Scandinavian countries as in the United Kingdom; in a general way, its incidence increases from north to south. While in Denmark and Sweden there was less than 1 case per 100,000 inhabitants in 1943, there were 6 in the Netherlands, 10 in pre-war Germany, 27 in Bohemia-Moravia, 36 in France (highest in the south), over 200 in Spain and probably not less in Italy, and 133 in Greece with only a fraction of the actual cases reported. Switzerland remained an area of low incidence. The problem of typhoid fever will naturally become more acute in areas where actual fighting has caused destruction of water supplies and herding of refugees.

Paratyphoid Fevers.—Paratyphoid fevers, on the other hand, are at least relatively more prevalent in the northern part of Europe, where cases are from 2 to 5 times more numerous than typhoid cases. In pre-war Germany the score is about even. In Southern Europe, on the other hand, paratyphoid cases are only a small fraction of the total enteric fever group.

Dysentery.—Dysentery is perhaps to be feared even more than typhoid fever during the immediate post-war period. The figures for this disease in the above table represent only the cases actually reported in Great Germany, Bohemia-Moravia, Hungary, Switzerland, the Netherlands, and the three Scandinavian countries, and these reports are everywhere defective. The big increase of dysentery cases over the pre-war level which took place in the Netherlands suggests that only a fraction of the cases occurring elsewhere in Central Europe have been notified. Fortunately, the type most commonly met with among the resident civilian population is the mild Sonne E. In the German Army, however, Flexner and Hiss-Y have prevailed, and there have been outbreaks of the Shiga type among prisoners of war. Their return from Central Europe may therefore give rise to epidemics of severe types, especially should such return occur in autumn. The spread of winter dysentery for some years past in the North Sea and Scandinavian areas is a new development, the significance of which is not yet clear. Amoebic dysentery seems nowhere to have attained epidemic proportions and is unimportant in Northern and Central Europe.

Epidemic Jaundice (Infectious Hepatitis).—The "new" disease of this war has been epidemic jaundice. From an obscure existence among the garrison of Malta and in a few German Army units, it assumed proportions to interfere occasionally with military operations, and spread among the civilian population from the Libyan desert to North Cape. The disease was really not new, but was known already from World War I, when at times it was confused with Weil's disease. It occurred also among civilians in various countries, but had never been considered capable of setting up veritable epidemics. The reported incidence has for each of the last two years been as high as 1% of the civilian population in Norway and 4% in some of the provinces. Even higher rates of incidence have been reported in certain military units in North Africa. It appears to have been widespread in Germany, but if it has been made notifiable the number of cases has remained a secret. Epidemic jaundice is notifiable only in the three Scandinavian countries, Finland, and Switzerland. About 65,000 cases were reported in these five countries in 1943, and returns for 1944 are on the whole not lower. The case-mortality rate has fortunately, at least hitherto, been fairly low, usually ranging from 1 per 1,000 to 1%, but there is some evidence that it increases with age. Epidemic jaundice is clearly a virus disease of an extremely high degree of infectivity and capacity for covering distances, which may have to do with the long period of incubation (3 or 4 weeks). Since its potentialities are unknown, and means of combating it have not so far been devised, this disease deserves to be closely watched.

Among other diseases of Mediterranean origin *papataci*, or sandfly fever, has given some trouble in the Balkans and in Italy. *Undulant fever*, whether of the Mediterranean or the Bang type, does not seem to have increased to any noteworthy extent during the war.

Poliomyelitis.—During the 20 years between the two world wars poliomyelitis has slowly spread from north to south in Europe, moving by patches of varying intensity. During the war years this spread has apparently become accelerated. The incidence is considerably higher on the Continent than in the British Isles. The most important poliomyelitis epidemics of 1943 occurred in Sweden, the Netherlands, and Central France. In 1944 Denmark, Sweden, and Switzerland were the principal sufferers, and in the former two countries the outbreaks reached their peaks only in November.

As might be expected, *cerebrospinal meningitis* has been much above its normal level ever since the beginning of the concentration of troops leading up to the war. Since 1941, however, there has been a gradual decrease in incidence, which, with minor exceptions, has constantly remained lower on the Continent than in the British Isles.

Encephalitis lethargica has not been heard from, except for the usual sporadic cases.

Diphtheria.—So far, diphtheria has turned out to be the leading epidemic disease of the war on the European continent, as a cause both of morbidity and of mortality. It is estimated that there were at least one million cases in 1943 outside of the U.S.S.R., and the case-mortality rate can at present not be set at less than 5%. In Germany alone nearly 300,000 cases were reported in 1943, with the rise continuing also in 1944, and there were 15,000 deaths from diphtheria in 1942. The incidence of carriers has increased enormously. The rise of diphtheria in Germany has been steady over a number of years, while in several other countries, and especially in Norway and the Netherlands, it has been explosive—attaining in 1943, respectively, 24 and 14 times the normal level. During the last three years there have been about 150,000 cases of diphtheria in the Netherlands. With a case-mortality rate in that country of nearly 7%, diphtheria has become one of the leading causes of death, running not very much behind tuberculosis, in spite of the rapid increase of the latter disease. A severe epidemic is prevailing also in Finland. The contrast with the experience in England, where diphtheria has actually been reduced during the war years, is most striking. On the Continent, a reduction has been attained—through vaccination—only in Hungary. Denmark, Sweden, and Switzerland have also maintained a relatively low incidence. The most serious development of diphtheria, however, is not so much its spread as the change in type and its increasing gravity. The proportion of severe croupous cases has increased, and particularly noteworthy is the increase of cases refractory even to early serum treatment. In a series of diphtheria necropsies performed in Germany 64% showed interstitial myocarditis, while this condition had formerly been found in only one-fourth of the post-mortem examinations. There has also been a shifting of the age incidence. At Rostock, in 1943, 30% of the diphtheria deaths occurred in persons over 15 years of age (6% before 1940), and 9% over 60. Diphtheria has been among the most important causes of fatal illness in the German Army, and it has also proved a fatal complication of typhus as well as of chest wounds.

Scarlet Fever.—Scarlet fever has spread almost as much as diphtheria, and with few exceptions its incidence is from two to five times the pre-war level. Nevertheless, there has been no explosive epidemic comparable to the diphtheria outbreaks in the Netherlands and Norway. There seems to have been no change in type or gravity of the disease. A heavy increase of measles has also been noted, especially during the earlier years of the war.

Influenza.—The only important epidemic disease which seems to have remained unaffected by the war is influenza. The usual winter waves have come and passed, the most recent reaching its peak during the early part of the winter of 1943–4. In spite of abnormal living conditions none of them attained the gravity of the three or four most serious inter-war epidemics. The change from influenza B to influenza A reported to have taken place in England between the 1942–3 outbreak and that of 1943–4 does not seem to have had any visible effect upon the mortality. Nevertheless, the danger of major epidemics cannot be entirely disregarded.

Endemic Diseases

In addition to the epidemic perils, the increasing incidence of endemic diseases, such as malaria, syphilis, and tuberculosis, must be carefully considered. *Malaria* is the leading cause of morbidity in a large part of the Mediterranean basin, and it is reported to have assumed epidemic proportions in Greece during the last couple of years. The areas of high endemicity in the Balkans and in Italy have probably by this time returned to their lamentable pre-control state, and further spread must be counted on, especially in view of the forced migrations. *Falciparum* infection predominates in autumn in truly Mediterranean countries, while further north *vivax* malaria prevails. The latter form may extend northward into Europe as it did after the last war.

Reports relating to the Scandinavian countries, Finland, France, and Germany indicate that the incidence of *syphilis* has increased threefold to ninefold, and the achievements of the 20 years of peace in venereal disease control have practically been wiped out. While the spread of *gonorrhoea* was checked for some years by successful sulphonamide treatments, virulent sulphonamide-resistant strains are now reported to be developing and spreading. Penicillin treatment has not yet become generalized. *Infectious skin diseases*, such as scabies, have also spread at an extraordinary rate, but the removal of soap from the list of luxuries should bring about a downward trend.

The war had no effect upon the *tuberculosis* mortality in 1939 and 1940, but an increase began in 1941 in several countries and became more or less general from 1942 and on. The situation is now much the same as during the period immediately after World War I, except that the increase this time started from a lower level. The part of the improvement gained from 1920 to 1939 which has been lost varies greatly. Great Britain, the Scandinavian countries, and Switzerland have withstood the years of trial remarkably well, although their tuberculosis problems may require increased attention during the first post-war years. The number of tuberculosis cases has increased greatly in France, Belgium, the Netherlands, Germany, Austria, Czechoslovakia, and Hungary, and it has doubled in many parts of this area. Among these countries the Netherlands are undoubtedly the worst sufferers. The Balkans, where the tuberculosis mortality was high also before the war, are probably back to the conditions of 25 years ago. In Italy the situation is likely to become worse than ever before, and Poland faces an unprecedented calamity.

Conclusion

In general, the epidemic outlook is not unlike the forecast which might have been made this day 27 years ago. As then, the general endemic level of nearly every kind of infection has risen, and serious epidemics have already appeared. In February, 1918, no one could have forecast the influenza pandemic, but other developments might have been foreseen had sufficient information been currently available. Unpredictable epidemics may occur, war or no war, but our knowledge of the existing situation is far more complete and up to date than then.

In several ways the outlook is darker than in 1918 because destruction of buildings and displacement of persons are far more widespread than during World War I. On the other hand, the endemic level was lower to start with in 1939 than it was in 1914, and the world is now better equipped to deal with many of the important infectious diseases. On the public health front World War I lasted not four but more nearly ten years. However, it was gloriously won. Many years of effort in combating infectious diseases have once more been lost so far as Europe is concerned. To make up for backsliding will take several years after the cessation of active hostilities, but the public health profession and services can win their war now as then.

Reports of Societies

THE VITAMIN B COMPLEX

A joint conference of the Biochemical Society and Nutrition Society was held on April 28 at the London School of Hygiene and Tropical Medicine. Prof. R. A. PETERS, who presided during the morning session, opened the proceedings with an expression of sympathy for the starving people in North Holland, and of the desire of all nutrition workers to give active help. After referring to the pioneer work of Eijkman and other Dutch investigators, Prof. Peters spoke of his own early work and that of Dr. Harriette Chick, of the Lister Institute, in the first steps towards the differentiation of the various members of the vitamin B complex. He emphasized that the labels vitamin B_1, B_2, B_3, etc., were originally adopted for the immediate convenience of the workers concerned. If the terminology had been changed in the light of additional knowledge it must not be implied that the original conclusions were necessarily at fault.

Dr. L. J. HARRIS, with Dr. E. KODICEK, in an introductory survey of the vitamin B complex, showed how, nearly 20 years ago, it had been found, mainly in work with rats and pigeons, that when sources of the original "water-soluble B" were heated until their antineuritic properties were lost certain other nutritive properties remained. This led to the postulation of two vitamins. The heat-labile factor was described as vitamin B_1, and has since been isolated and synthesized in the form of aneurin. The second factor was termed vitamin B_2. It was soon found that riboflavin, a yellow fluorescent substance isolated from milk whey, and now known to be very widely distributed in living tissues, could restore growth in animals restricted to diets deficient in vitamin B_2. The responses were not complete, however, and it became obvious that other factors were involved. Thus on treatment of concentrates of vitamin B_2 with charcoal and other adsorbents some factors were adsorbed while others passed through into the filtrate. The list of the better-known members of the complex was now as follows: *Heat-labile*, vitamin B_1 or aneurin. *Heat-stable*, vitamin B_2, which resolved into *adsorbed factors*, riboflavin, nicotinamide, and pyridoxine; *filtrate factors*, pantothenic acid, *p*-aminobenzoic acid, inositol, and choline; *unclassified factors*, biotin, folic acid, and grass-juice factors. The structural formulae for about nine of these vitamins were known. Biochemical roles in some specific enzyme action had been found in five cases. The essential roles of vitamin B_1, nicotinamide, and riboflavin were well known in relation to the deficiency symptoms of beriberi, pellagra, and cheilosis respectively. Pyridoxine and biotin were also probably required by the human subject. On the other hand, *p*-aminobenzoic acid and inositol might be required only for the well-being of the intestinal bacteria, which in turn might produce vitamins essential to the host. For such factors the term "secondary factors" might be appropriate.

Action in Enzyme Systems

Dr. J. H. QUASTEL, summarizing the many parts played by members of the vitamin B complex in enzyme systems, pointed out that the highly important relationship which existed between aneurin and carbohydrate metabolism was discovered by Peters and his colleagues. They found that in avitaminosis B_1 the brain could not metabolize glucose or lactic acid at the normal rate. This defect might be observed with the isolated tissues *in vitro*, and be remedied by the addition of small quantities of the vitamin. The precise point of failure was in the utilization of pyruvic acid, which accumulated in the tissues as a result of aneurin deprivation. The next important step was the discovery by Lohmann and Schuster that co-carboxylase, which was essential for the activity of yeast carboxylase, was aneurin pyrophosphate. This substance, rather than aneurin itself, was then found to be coenzyme of pyruvate oxidation. This comparatively simple situation, however, had been greatly elaborated as the result of subsequent research.

Nicotinic acid was obtained by early workers during attempts to isolate the antineuritic vitamin from yeast or rice polishings

In 1934, however, it attracted interest from a different direction, when Warburg and Christian showed that nicotinamide was present in the coenzyme involved in the oxidation of hexose-monophosphate. Later Euler and his colleagues also obtained nicotinamide from cozymase, the coenzyme of alcoholic fermentation. It was left to Elvehjem to prove that nicotinamide cured the disease "black tongue" in dogs, which was analogous to pellagra in man. As with aneurin, research had revealed that nicotinamide intervened in metabolism at numerous points. It was concerned not only with carbohydrate but with protein metabolism, its general role being that of an intermediary capable of receiving hydrogen from various substrates activated by different enzymes and of passing it on to other substrates activated by other enzymes. Riboflavin was isolated from yeast by Warburg and Christian as a conjugated flavoprotein, which was called "yellow enzyme." Soon afterwards Kuhn, Györgyi, and Wagner-Jauregg obtained riboflavin from milk, and found that it had growth-promoting action in animals. Numerous flavoproteins had been described, and might be regarded as a special class of dehydrogenases. One of their numerous roles was to act as "diaphorases" in facilitating the oxidation and reduction of coenzymes containing nicotinamide. Less was known of the part played by other B_2 vitamins in enzyme systems, but pyridoxine was concerned in the decarboxylation of amino-acids.

Less Familiar Members

Dr. F. A. ROBINSON followed with an account of the recently characterized members of the vitamin B_2 complex. Pyridoxine, and the related bacterial agents pyridoxal and pyridoxamine, pantothenic acid, *p*-aminobenzoic acid, the anti-anaemia factors α and β pyracin, xanthopterin, the monkey vitamin M, and several other less familiar factors were mentioned. It seemed probable that the distinction of the better-known vitamins—aneurin, riboflavin, and nicotinamide—from the lesser-known members of the vitamin B complex was more real than might be supposed. Present evidence suggested that the animals only showed specific deficiency symptoms in the absence of the first three vitamins. The others might be required only for the well-being of the intestinal flora. Inositol and choline, apart from their effect on bacteria, were known, however, to help in preventing an undue accumulation of fat in the liver, and might therefore be considered as a separate lipotrophic group.

Dr. B. C. J. G. KNIGHT, discussing growth factors and growth inhibitors for micro-organisms, emphasized that the wide distribution in nature of similar enzymatic systems supported the conception of the fundamental unity of all biochemistry, whether studied in yeasts, bacteria, fungi, protozoa, or higher animals. Thus it was now almost a commonplace occurrence that nutrients first found to be necessary for bacteria should later prove to be essential for higher animals, or vice versa. Usually when an organism did not need a certain substance as a nutrient the reason lay in its ability to synthesize this substance for itself. In building coenzymes I and II different micro-organisms were known which required ammonia, nicotinic acid, nicotinamide, or nicotinic riboside as a starting-point. The study of the action of growth inhibitors had furnished information of great biochemical interest. Woods discovered that the bacteriostatic action of sulphonamides was prevented by *p*-aminobenzoic acid, which was a naturally occurring metabolite. *P*-aminobenzoic acid was soon found to be a growth factor for several bacteria. Fildes concluded that growth inhibitors were substances which resembled essential metabolites sufficiently to compete with them in enzyme systems or in other ways, but which could not fill the specific role of the metabolite. The bacteriostatic action of the sulphonamides must therefore be ascribed to their interference in the metabolism of the chemically similar *p*-aminobenzoic acid. Many other examples of inhibition were now known; thus riboflavin was inhibited in its action by iso-riboflavin and mepacrine, aneurin by the related pyrithiamin.

Dr. F. BERGEL recalled that Williams in America had recently designated certain vitamins, including aneurin, riboflavin, and nicotinamide, as "major" vitamins, whereas the lesser-known B vitamins were termed "minor." The division was at least in line with the production of more characteristic and specific lesions in the absence of the "major" vitamins.

Synthesis and the Intestines

Dr. B. S. PLATT described the brewing of Kaffir beer, which in his belief had great value in maintaining the health of the natives. Clear beer, as brewed in this country, contained no aneurin, though it was a good source of riboflavin. The unclarified native beer was rich in all members of the vitamin B complex. In the West Indies the steps taken to improve nutrition included the provision of 80% extraction flour "ennobled" with 3% of food yeast. More information on the synthesis of the vitamin B complex in the human intestines was urgently required. It was important to realize that the products of bacteria were greatly influenced by the substrate. Thus bacteria which produced toxins, indol, or proteolytic enzymes when cultured upon proteins produced only lactic acid when cultured upon carbohydrates. After a heavy meal rich in carbohydrate the alcohol content of the blood, so far as could be judged from methods of estimation at present available, might sometimes be increased to levels consistent with advanced inebriation, suggesting that alcohol might possibly be produced in the intestines.

Dr. LUCY WILLS, speaking of her work on the vitamin B_2 complex and anaemia, said nutritional macrocytic anaemia was an important disease in India and other tropical countries. Clinical and experimental investigations, however, had shown that the missing nutrient was not Castle's extrinsic factor if defined as a substance which reacted with the intrinsic factor of the stomach to form the liver principle. In uncomplicated cases of nutritional anaemia in man and monkeys which had received no previous treatment with fractions of the vitamin B_2 complex highly purified liver extracts were inactive. The curative factor was present in crude liver preparations and in autolysed yeast extracts, but had not so far been identified. Since it was effective when administered parenterally it was unlikely that the intrinsic factor of the gastric juice was involved.

Dr. F. PRESCOTT questioned whether the vitamins synthesized in the human intestines were efficiently absorbed or were for the most part excreted in the bacterial debris of the faeces. He recalled that milk protected against pellagra, though little different from maize in its nicotinic acid content. This suggested that its good influence was due to its effect on the intestinal bacteria. It was an interesting point that the mental symptoms caused by the suppression of the intestinal bacteria with sulphaguanidine should resemble those characteristic of pellagra.

Dr. L. J. HARRIS, who presided during the afternoon session, commented on the extent and importance of recent developments in research on the vitamin B complex. A remarkable feature had been our familiarity with five members of the complex—namely, nicotinic acid, riboflavin, *p*-aminobenzoic acid, choline, and inositol—before their significance as vitamins had been recognized. Other vitamins, however, such as aneurin, with its bridged iminazole and thiazole rings, turned out to be chemical "novelties" with highly unusual structures. More knowledge on human requirements for B vitamins and on methods for the clinical recognition of the results of deficiency was urgently needed.

A national conference on maternity and child welfare has been arranged by the National Association of Maternity and Child Welfare Centres and for the Prevention of Infant Mortality, on behalf of the National Council for Maternity and Child Welfare. It will be held at Friends House, Euston Road, N.W., on Thursday and Friday, June 28 and 29, and the Minister of Health will give his presidential address at 10.30 a.m. on Friday. The subjects for discussion are: (1) nutrition as it affects the well-being of expectant mothers and of children; (2) the importance of maintaining the unity of the maternity and child welfare services; (3) the State and the parent in relation to the child. Tickets, 3s. each for one day, 5s. each for two days, may be had from the secretary, Miss M. R. Lovelock, Carnegie House, 117, Piccadilly, London, W.1. A clinical course for medical practitioners attending the conference has been arranged by the Maternity and Child Welfare Group of the Society of Medical Officers of Health for the morning and afternoon of Saturday, June 30. Particulars and tickets will be sent on application to Dr. Miriam Florentin, Town Hall, Church Street, Stoke Newington, N.16.

Correspondence

Dangers of Caudal Analgesia

SIR,—Dr. FitzGerald and Dr. Galley (May 12, pp. 677–8) are apparently enthusiastic advocates of continuous caudal analgesia in childbirth. The former, after attending the course in continuous caudal analgesia by Drs. Hingson and Edwards in Philadelphia, regrets that with one exception he can find no evidence of active interest in the method in any British hospital. Dr. Galley charges British obstetricians with prejudice, apathy, and conservatism in their attitude towards, and ill-informed criticism of, "newer methods of securing analgesia," by which, judging from the context, he apparently also means continuous caudal analgesia.

Dr. FitzGerald admits that the method "does somewhat alter the normal course of labour." This is putting it mildly, for the patient, besides being unable to empty her bladder, has no urge to bear down or use her abdominal muscles in the second stage of labour, and in consequence normal flexion of the head and rotation of the occiput are seriously interfered with, so that the second stage is prolonged and persistent occipito-posteriors and deep transverse arrests are common. FitzGerald, Thomson, and Brown found that the incidence of forceps delivery was increased to 70% compared with 12% in 1939 (before caudal). Siever from experience of 1,200 cases found that persistent occipito-posterior cases occurred in 12% compared with 4% before caudal. Hingson and Edwards report a similar experience. Infection at the site of injection is another risk. Hingson and Edwards have reported one death from this cause. Siever has had two such cases. One of the women got arachnoiditis; a laminectomy was done. The patient is "gradually recovering bladder function and the use of her legs, but the prognosis is guarded." As for the effect on the baby, in one of Siever's cases the foetus died *in utero* 5 minutes after the third injection. Within 2 minutes the foetal heart sounds became slow and gradually got weaker and stopped. In Siever's opinion this death and the deaths of three other babies in his series were due to the drug injected (metycaine).

The subject of continuous caudal analgesia in obstetrics was discussed very fully at a meeting of the Chicago Gynecological Society in October, 1943 (reported in the July, 1944, number of the *American Journal of Obstetrics and Gynecology*). In that discussion Huber mentioned 2 cases of his in which metycaine was given for Caesarean section. After 30 c.cm. of a 1.5% solution had been injected vasomotor collapse occurred. The blood pressure fell to 60/40 and so remained for 3/4 hour. The foetal heart sounds fell to 60. The baby after delivery proved to be not normal. At the time of the discussion it was 7 months old and very definitely abnormal. In another case of Caesarean section the patient also collapsed. The foetal heart sounds fell to 50 or 60 and remained so for 1/4 hour. After delivery it made one or two respirations and then could not be resuscitated. Baptisti—whose paper, by the way, every enthusiast for, or would-be user of, caudal analgesia should read—considered that though the risks of continuous caudal analgesia could be minimized by caution they could not be entirely eliminated. Among the risks he emphasized was intradural injection with respiratory failure and sudden death. This might happen in the most experienced hands. Sudden death might occur apart from intraspinal injection. "A press campaign in the United States represents caudal anaesthesia as safe and painless childbirth. . . . The movement has to some extent stunned the medical profession to the point of clouding its judgment." Now "physicians are beginning to awake to actual facts . . . caudal anaesthesia is no safer to-day than it ever was. . . . The use of such a hazardous procedure *electively* to relieve the usually innocuous pains of labour is unjustifiable. Since the recent advent of continuous caudal analgesia four women have lost their lives because of the procedure *per se*. There have been other 'close calls' reported. . . . Never before has the human nervous system been subjected to the action of such prolonged concentrated anaesthesia. The absence of residuals and sequelae remains to be proved." Because of the death of the one-hundredth obstetric patient receiving caudal analgesia two minutes after injection the method was abandoned in Johns Hopkins Hospital, Baltimore, in 1940. "It seems strange," says Baptisti, "that the tragic accidents are so frequently delayed but apparently they eventually do occur."

An ideal analgesic in childbirth should be safe for mother and child. Judging from these reports continuous caudal analgesia is safe for neither. That is why it has never become popular among British obstetricians, not because its use calls for "increased time and skill from the obstetrician and anaesthetist" nor because of apathy, conservatism, and prejudice, as Dr. FitzGerald and Dr. Galley respectively assert.—I am, etc.,

Obstetrical Unit, U.C.H. Medical School, W.C.1. F. J. BROWNE.

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Skin Cover of Wounds

SIR,—Major-Gen. W. H. Ogilvie in his valuable survey of our experience of war surgery and the adaptation of this experience to civil practice (May 5, p. 619) is concerned in a statement of surgical principles. There is one principle, however, in the skin cover of wounds that he omits and which I believe deserves notice. It is that the skin cover of wounds must be generous enough to allow full functional recovery; particularly is that important in wounds of the extremities.

I am a little afraid, therefore, of the practical interpretation of his statement that "a certain amount of tension may be used to approximate the skin without danger." An unqualified application of this principle will lead to indifferent functional end-results. From the experience of mistakes I have made and observed, adequate skin cover is essential to good functional end-results. Recently I have seen three patients who had previously been treated by delayed suture of wounds of the popliteal fossa, sutured undoubtedly with "a certain amount of tension." The wounds had healed but the scars were responsible for a considerable deformity and great restriction to the function of the knee-joint. Only when these scars were excised and the knee fully extended was it possible to assess the true skin defect. Full return to function followed the making good of this skin defect by skin graft.

Nowhere in the body is the principle of adequate skin cover more important than in the treatment of wounds of the hand. For example, a wound on the dorsum of the hand, even with a considerable skin loss, may be closed by delayed or even primary suture with "a certain amount of tension" in dorsiflexion and extension of the fingers and it will heal, but the functional end-result of such a hand will be poor, and "making a fist" impossible.

One of the big lessons of this war, I would suggest, is the value of early and adequate skin cover to wounds of the extremities with skin loss, so that full function is quickly regained after healing. The importance of valuating the area of skin loss before closing the wound should be emphasized. For example, the popliteal fossa should be examined with the knee fully extended; the axillary wound with the shoulder in full abduction; wounds of the dorsum of the hand with closed fist and the wrist slightly flexed. If the wound edges under these conditions approximate, only then is suture preferable to grafting.—I am, etc.,

Birmingham Accident Hospital. WILLIAM GISSANE.

Treatment of the Recently Starved

SIR,—I would like to record my experience with a recently repatriated prisoner of war who was making very poor progress even on the double rations and sedulous care of his family. He had not been able to digest his food, which had caused him discomfort, flatulence, and nausea, and he had not been gaining much weight.

Some simple and well-known adjuvants to the digestive processes having made a vast improvement, I make bold to pass them on, as possibly other doctors faced with the same problem may be glad of the suggestions. I have given one 2½-gr. tablet of "taka-diastase" to be chewed during the meal. At the end of the meal a dose of the following mixture: glycerin. acid.

pepsin. ʒii; tr. zingib. et tr. gent. co. āā mx; aq. menth. ad ʒss. Half an hour after the meal 2 tablets of "trypsinogen." gr. 5; at night a tablet of "veracolate," a preparation of ox-bile salts. I have told the soldier that he could eat whatever he felt inclined to take.

Having observed immediate and dramatic improvement in this man's comfort and a splendid gain in weight, I have felt it was well worth while bringing forward my experience, as there are thousands of soldiers recently freed who deserve the best we can give them. Fortunately I had by me plenty of the enzyme materials for my cases, but I understand that the supply is very limited, and if other doctors less well supplied were inclined to prescribe such treatment it would be impossible for them to do so. It seems illogical to expect glands which have lost capacity from long disuse to regain functional power without themselves being renourished, which is only possible if their part in the digestive process is done artificially. The supply of enzyme materials should, in my opinion, have a very high priority at the present moment.—I am, etc.,

Cirencester. J. H. GROVE-WHITE.

Transfusion Service

SIR,—As the result of blood donors' generosity during the war ample supplies of whole blood and plasma have been available for the treatment of civilian patients in hospitals, with the result that the staffs of hospitals have grown accustomed to unstinted supplies. On the basis of the past two years we have used at this hospital approximately 1,000 pints of blood and 1,000 pints of plasma annually, but the number steadily increases. This works out at 2.5 pints of each per occupied bed and the bleeding of approximately 4,000 donors per annum.

While it is possible that a substitute for plasma may be forthcoming, it is difficult to imagine a future when whole blood would not be required. Blood transfusion is one of the most valuable therapeutic measures available, but like other treatment it costs money and must be paid for. Questions to which I would like an answer are these:

1. Can an adequate supply of blood donors be obtained without payment and/or pressure on relatives and friends of patients to supply blood?

2. How far should the personnel employed in bleeding, grouping, and administration of the service be on a voluntary basis?

3. Are we to continue to enjoy the valuable aid of the Ministry of Health in the processing of plasma and the supply of apparatus? Can we rely in the future on the help of special laboratories, such as the Galton Laboratory at Cambridge, to help in elucidating grouping problems?

These are questions which must be common to many transfusion officers, and now with peace in Europe demand an early and satisfactory solution.—I am, etc.,

East Suffolk and Ipswich Hospital. E. BIDDLE. Transfusion Officer.

Artificial Respiration

SIR,—Dr. E. Clark Noble (May 5, p. 643) points out the danger of delay in instituting artificial respiration. It would be well to stress the importance of the other two basic principles:

1. *Maintenance of a Clear Airway.*—I was recently called to a patient recovering from an anaesthetic. He was black in the face, the nurse pinning her faith to oxygen blown on to his face. When the jaw was pulled forward the obstruction was relieved, and the patient breathed at once.

2. *Adequate Pulmonary Exchange.*—The choice of any one particular method of effecting this is of little importance compared with the skill of the operator. If the patient is dead no method will avail; if there is a spark of life it is probable any method, properly carried out, will be successful.—I am, etc.,

Nuffield Department of Anaesthetics, Oxford. R. R. MACINTOSH.

Civilian Mass Radiography

SIR,—The stimulus of your leading article (April 14, p. 521) should bring in sufficient accounts of the working methods of some of the civilian units to furnish material for a résumé on this subject. The work now being done may not then appear quite as haphazard as was suggested originally.

There is little doubt that the best practical use for a mass radiography apparatus allotted to a large county area, such as Lancashire or the West Riding of Yorkshire, is that outlined by Dr. Lissant Cox (April 28, p. 605)—i.e., that the mass radiography service should act as a diagnostic outpost and work in the closest co-operation with the tuberculosis dispensaries in the several areas. It is clearly impossible for a constantly moving outfit in a large district to do its own follow-up work—e.g., when cases discovered at factory "A" are due for a three-monthly check, the unit may be at factory "B" 50 miles away, and so on.

This unit is operated on similar lines with certain modifications devised by Dr. F. Ridehalgh, its medical director. Here the weekly clinical session held at the factory is a joint one, where the medical officer of the mass radiography service and the tuberculosis officer of the local area see the cases together. If it is not possible to come to a diagnosis at once, and if, as with these early symptomless lesions, further investigation and observation are necessary, the tuberculosis officer arranges for this at his own clinic. There is, therefore, no question of a "snap diagnosis" being made on the spot. Institutional treatment is not advised unless there is clinical indication of activity or radiological evidence of spread—i.e., after repeat *x*-ray examination. The situation is carefully explained to the examinees, and in our experience hardly any have demurred over attending the clinics for a periodical check.

The joint clinic provides the medical officer in charge of the unit with first-hand information of the line of action to be taken on all mass radiography cases passing into the care of the tuberculosis officer. The vital matter of follow-up of all possibly significant lesions discovered by mass radiography has always been provided for. The Leeds Tuberculosis Clinic sends to the mass radiography service periodic reports of all cases referred to them. When any radiological change is noted in the follow-up films, there is every facility for the inspection of these films and the case notes by the mass radiography medical officer. The tuberculosis authorities in the West Riding are proving equally co-operative.—I am, etc.,

City of Leeds Mass Radiography Service. MICHAEL G. MAGAN, Assistant Medical Director.

Tuberculosis of the Lower Lobe

SIR,—I found Dr. Raymond C. Cohen's article on tuberculosis of the lower lobe (May 12, p. 662) of great interest, particularly his statements on middle-lobe lesions. He mentions the treatment of a number of cases of mid- and lower-lobe lesions by phrenic paralysis followed by pneumoperitoneum, and concludes: "The results so far have been very successful, particularly with middle-lobe cavities and cavities in the middle or periphery of the lower lobe."

In contrast to Dr. Cohen's finding, however, are those mentioned in an annotation on artificial pneumoperitoneum in the *Lancet* of April 28 (p. 534). Here it is stated that Rilance and Warring (*Amer. Rev. Tuberc.*, 1941, **44**, 323), in their 55 cases of artificial pneumoperitoneum with phrenic crush, noted that the best results were obtained in lower-zone cavities, next best in upper-zone cavities, and *worst in mid-zone cavities* (italics my own). Clifford-Jones and Macdonald (*Tubercle*, 1943, **24**, 97) agree with these findings.

There is, of course, an anatomical explanation in keeping with these clinical findings. In the book *Pulmonary Tuberculosis* by Kayne, Pagel, and O'Shaughnessy (Oxford University Press, 1939) it is stated (p. 393) that, "provided the pleura is free, paresis of the diaphragm curtails or even abolishes the ventilating function of the lower lobe of the lung but leaves the function of the upper lobe undisturbed. The position, however, is quite different when, as a result of an old inflammatory process, adhesions have obliterated the interlobar sulcus; for under these conditions paresis of the diaphragm has a very definite effect in limiting ventilation of both lobes of the lung. In view of these facts the old controversy as to the effect of phrenicectomy on lesions in the upper lobe has been brought to an end. An effect will be produced if the lobes are adherent and the interlobar septum obliterated."

In a chronic disease of such protean manifestation as pulmonary tuberculosis these conflicting opinions confuse one as to the value of a particular method of treatment. Permanent control of the disease is, of course, our ultimate objective, and

symptomatic improvement alone, no matter how satisfying at the time, if of no great importance in the final analysis. We must therefore distinguish between temporary control of the disease and permanent arrest of the disease. Dr. Cohen mentions that "the results *so far* [italics my own] have been very successful," and one can only conclude that a further communication will be necessary to decide whether or not the final results were as successful.—I am, etc.,

Preston Hall Sanatorium, nr. Maidstone. GEORGE R. W. N. LUNTZ.

Prolapse of the Rectum in Women

SIR,—The article by the late Mr. Harold Chapple (May 12, p. 661) draws attention to the successful treatment of a rectal prolapse in a woman by operating from the abdominal approach. Dissatisfied with the outcome of various operations performed *from below* and following the recommendation of R. R. Graham (*Ann. Surg.*, 1942, **115**, 1007) I carried out a similar procedure lately on a single woman, an epileptic aged 38, who was still having severe fits and had suffered from rectal prolapse for years. Five inches or so of bowel protruded on straining, despite surgical treatment elsewhere three years before. The peritoneum of the pouch of Douglas was incised, the fascia covering the levator ani muscles was brought together by sutures deeply placed *in front* of the rectum, and the peritoneal pouch obliterated by a further tier of sutures above the first. The principle of the method is based on the assumption that a complete rectal prolapse is essentially a sliding hernia of the anterior wall of the rectum (Jeanell). Additional support was obtained by anchoring the colon to the lateral pelvic wall near the brim; this step was possibly unnecessary. To avoid injury to the ureters these were identified before placing the sutures. Shock was not a conspicuous feature of this operation, which was performed under general anaesthesia, and the after-course was uneventful; the bowels, with the aid of liquid paraffin, acted on the fifth day. It is too early to pronounce on the ultimate result, but the immediate effect has been very gratifying.—I am, etc.,

St. Andrew's Hospital, E.3. J. R. M. WHIGHAM.

Women in Labour

SIR,—I fully endorse the remarks of Dr. John Elam (April 7, p. 495) on gas-and-air analgesia and on the apparent indifference to the suffering of women in labour which still exists among both doctors and midwives. General practitioners as a whole seem satisfied to rush, at the last possible moment, to arrive as the baby's head is about to be born and to administer a few drops of anaesthetic. Is the doctor's satisfaction shared by the patient? As a rule the only women fortunate enough to receive any analgesic are cases of abnormal labour. The penalty for a normal labour is having to go through hell unaided.

Perhaps doctors may justify their indifference by quoting Dr. Dick Read's doctrine that normal labour is painless, but the essence of Dr. Read's teaching is that doctors must take more time and trouble in instructing and measuring childbearing women. He would be among the last to claim that normal labour in the average unenlightened and unaided woman of to-day is painless.

For the present "lamentable state of analgesia in labour" Dr. A. H. Galley (May 12, p. 678) suggests five reasons: apathy, conservatism, prejudice, lack of apparatus or facilities, and lack of anaesthetists. I would like to add another: inability to do a rectal examination. When giving analgesics in labour it is essential to know how far on the patient is, and to be able, if necessary, to check subsequent progress. The objection that this requires extra P.V. examinations would be sound were it not that rectal examination is available, and is quicker, less dangerous, and may be repeated as often as necessary. With practice a P.R. is almost as informative as a P.V. without an anaesthetic, and I consider that to master the art of doing a P.R. is a necessary preliminary to safe and satisfactory analgesia.

Dr. J. K. B. Waddington (May 12, p. 678) comments on the difference between "the callous attitude" of some institutional midwives and the sympathetic co-operation of most domiciliary midwives towards relieving the pains of labour. Surely the reason is obvious? The relatives and friends of a patient confined at home usually abound in sympathy for her, and, though often exasperating to the nurse and doctor, their concern does result in extra consideration for the sufferer.

To give analgesics in labour necessitates an extra visit or two to the patient's bedside, but the gratitude of the mother in itself is ample reward for the extra trouble. Anything really worthwhile requires extra effort. Surely the falling birth rate would be arrested and the willingness of women to have more than one baby would increase if, with help, labour ceased to remain in their memory as an unforgettable nightmare.—I am, etc.,

Reading. K. D. SALZMANN.

SIR,—I should like to express my agreement with Dr. J. K. B. Waddington on the subject of women in labour. As a student I acquired a permanent dislike of obstetrics because of the callous attitude of the midwives towards the patients, and the consequent unnecessary suffering which I was forced to witness. The midwives would refuse to give even the simple analgesic mixture which they were allowed to administer without a doctor's permission. We students had many altercations with them on the subject; the commonest argument they used was: "Women have had children without anaesthetics for thousands of years." When we asked them whether they would apply the same argument to the reduction of fractures, for example, they had nothing to say. They are particularly unkind to the nervous type of patient with a rigid cervix and ineffectual, but often agonizing, pains, their attitude being, "Fancy making all that fuss over such little pains."

When I did my midwifery training the maternity wards were closed owing to the blitz, and any woman who remained in London had to have her baby at home. I remember asking the district midwife to show me how to use the Minnitt machine, which they were compelled to take out with them. She replied: "Oh, I don't believe in that; they have better pains without it. I just give them the mask without turning on the gas." The net result was that every woman, primiparae included, went through her labour from start to finish unaided.

Why do all women of the higher income levels employ doctors rather than midwives for their confinement? The reason is that they thus ensure at least some measure of relief from their pain. The great majority of women will continue to suffer until midwifery comes completely under the control of the medical profession instead of that of the Central Midwives Board.—I am, etc.,

London, W.8. ANGELA HEFFERMAN.

SIR,—Having recently spent seven weeks in maternity hospitals as a midwifery student, I should like to confirm the strong criticisms which have been directed against the inadequate analgesic measures employed in labour. During my course I conducted twenty-six deliveries, and either assisted at, or witnessed, thirty-two others—a limited but probably representative sampling. It came, indeed, as a profound shock to me, after the pious injunctions I had read in textbooks, to find that "analgesia in labour" was more often a polite fiction than a reassuring fact.

I am sure that administrative and economic difficulties are largely to blame. Six weeks of my studentship were spent in council hospitals which were obviously suffering from lack of staff. Yet my remaining week, passed in a world-famous voluntary maternity hospital, has no lurid or harrowing associations. The labour ward on the occasion of a delivery swarmed with nurses, each of whom had a definite duty to perform, while the analgesia obtained seemed to be highly efficient, though nothing more elaborate than the Minnitt machine was employed.

Unfortunately, lack of staff at one of the council hospitals was combined with lack of apparatus, since the Minnitt machines were either absent or defective in mechanism. Still more unfortunately, this want of staff and gear tended to breed in the midwives a "rationalization" of the circumstances, so that they would exhort the luckless mothers, more commonly in anger than in pity, to show a fortitude which should never have been necessary. Any protest could be met by the contention that analgesia was superfluous because labour was "physiological process." So, I suppose, is cutting a wisdom

tooth, but would any sane person deny the sufferer aspirin on that account?

I doubt whether one can justly accuse the average midwife of taking a wanton delight in the spectacle of pain (it surely goes without saying, of course, that no sadist should be allowed to practise medicine or nursing); but I am afraid midwives can very easily acquire the habit of excusing the lack of analgesic facilities on the pernicious and illusory principle that the pain of labour is something which should be endured for its own sake. This discredited metaphysical concept of the virtue of physical suffering *per se* is certainly one which should never find a place in the practice of medical science.

Finally, it is only right to mention that certain "difficult" women seemed to make the task of the midwife particularly arduous, and that the threshold for pain stimuli has a subjective as well as an objective component. She who yells most does not necessarily feel most!—I am, etc.,

London, S.W.10. J. A. FLETCHER.

Decay of Teeth

SIR,—Sir Edward Mellanby has maintained that the decay of teeth and rickets are one and the same problem. There is, however, much evidence against this being the case. Rickets has been reported on from North Indian districts unaccompanied by decay of teeth. Natives in general suffer from such decay only when they come to eat white flour and sugar in place of their own diet. There is said to be a district in Texas where there is no decay of teeth in people living there on the food grown in that district. It is reported that North Shields with a moorland water supply has much more tooth decay among its inhabitants than South Shields with a water supply taken from wells.

Where there is enough fluorine in the diet to produce slight mottling of the enamel there is little decay of the teeth. Fluorine is a natural constituent of the teeth, and the traces of it found in wheat are removed on separating off-white flour. The washing of wheat in the roller-milling process not only leads to fermentation of the germ and the need for separating this from flour but removes traces of those imponderable metals which are found in soil and are needed for health. The excessive cleaning of vegetables, peeling of potatoes, etc., must also remove these imponderables. The substitution of reservoir water for well water, while protecting us from disease such as typhoid and cholera, has also removed these imponderables, the need for which is shown by researches on domestic animals.

Much has been made of laboratory experiments which show that phytic acid present in whole wheat lessens the absorption of calcium. This last has, therefore, been added to wartime flour. On the other hand Scots have ever been a vigorous race in the past, fed largely on oats and kale. The Russians' main winter diet is wholemeal and pickled cabbage, and they are the hardiest and toughest of people. Horses and fowl flourish on whole grain and greenstuff. Vast human experience seems to outweigh the laboratory experiments. The children of those who are poorly off—the main mass of the nation—suffer from interference with the natural food—wholemeal bread—an interference which has made the fortunes of millers before the war.

Unquestionably white flour makes a most palatable bread and is best for pastry and biscuit-making, but for the sake of the children of the nation the cheap national loaf should be one made of wholemeal.—I am, etc.,

LEONARD HILL.

Infection from Dead Teeth

SIR,—The article by Prof. Sprawson and others (April 21, p. 551) and Dr. Malik's letter (May 12, p. 679) raise important questions that dentists would be glad to have answered. If it be asked whether all pulpless teeth are, or are bound later on to be, septic the answer seems to be in the negative. Histological evidence shows that in many cases the cemental sheath is vital and healthy, and, moreover, the apical foramina may be plugged with a growth of healthy "bone." *X*-ray evidence is so often to the effect that no bone change has taken place that it is often regarded as inconclusive. To my own knowledge the apex of a tooth removed in the operation of "apical resection" has been reported by the bacteriologist to be sterile.

Clinical evidence shows that vast numbers of patients carry pulpless teeth with no signs of ill-health. It is, however, a fact that some pulpless teeth act as dangerous septic foci. Careful clinical and radiological investigation coupled, if need be, with consultation with the patient's physician and a pathologist should enable a dentist to separate pulpless teeth into two classes—one containing all the dangerous cases and another to which a "clean bill" can be given. It is quite true that if all pulpless teeth had been removed some people would be alive who are now dead; also if all tonsils and appendices were removed in childhood much serious trouble would be avoided.

The treatment of pulpless teeth that are judged suitable for retention is a matter of great importance, and unless a dentist is prepared to give the care indicated by the researches of Prof. Sprawson and others he should not undertake such treatment. Until the correlation between various kinds of ill-health and various classes of pulpless teeth has been settled by teams of expert workers, I feel that dentists are doing good service to the community by preserving a certain number of pulpless teeth on the lines I have indicated.—I am, etc.,

Reading. J. B. PARFITT.

Technique of Venepuncture

SIR,—I was much interested in the article by Dr. Mendelssohn and Prof. Witts on transmission of infection during venepuncture for withdrawing blood (May 5, p. 625). I have known Prof. Witts for many years, and have the greatest respect for his opinion, so I am sure he will not be offended if I suggest that his technique of venepuncture is faulty. He states that the tourniquet must be released before the needle is withdrawn, but I would maintain that this should never be done until the needle is taken out. With a proper technique no haematoma will result.

The method I have used for the last twenty years is as follows: The needle is inserted as usual, after distending the vein by means of a tourniquet, and the blood is drawn into the syringe by traction on the piston. The last few millimetres may be allowed to enter passively. A pledget of wool soaked in the skin-cleansing agent is then lightly held over the puncture area and the needle is withdrawn. Simultaneously firm pressure is made on the pledget of wool. Still holding this with one hand, the operator puts down the syringe and uses the hand thus released to unfasten the tourniquet. This is easily done, as the tourniquet consists of a piece of rubber tube with a spring clip attached to one end. The patient's arm is then flexed as far as possible and left thus for three minutes.

I may mention that I have used this technique to collect blood for sedimentation rate into an unsterile syringe for over fifteen years, during which time some forty to fifty thousand such estimations have been made, and there has so far (touching wood) been no single case of jaundice or resulting trouble of any kind. I think, on the other hand, that if unsterile syringes are used, two-piece glass syringes are to be avoided, as the plungers nearly always run too easily, even when they are new. We reserve these for dry-sterilizing and use them for other purposes than sedimentation rate. For the latter we use Record syringes that fit well. If the pistons run too easily the piece of spring-steel wire that encircles the piston in the groove in its centre is easily expanded to fit the bore more closely and thus act as a brake.

Where very large numbers of cases have to be seen (as in many clinics for rheumatism or tuberculosis) it is often a matter of considerable difficulty to maintain the very large number of sterile syringes that would be needed for the necessary sedimentation rates, and it seems to me that the above technique, if properly carried out, should be safe. The needles should always be dry-sterilized, preferably in tubes in a hot-air oven.—I am, etc.,

Hayward's Heath. J. W. SHACKLE.

Multiple-pressure Vaccination

SIR,—I too read with interest the account of smallpox vaccination by the multiple-pressure method given by Dr. H. J. Parish (Dec. 16, 1944, p. 781), and the letter of Mr. J. F. Jarvis (May 5, p. 643). This method was demonstrated to me by Surg. Capt. May, R.N., and Surg. Cmdr. Patterson, R.N.,

in 1930. They were vaccinating a group of boys at the Naval School, Greenwich. I do not know if a record of their work exists. I have used the multiple-pressure method on all occasions since that demonstration.—I am, etc.,

Ilford. JOHN SPENCER.

Soya Bean and Allergy

SIR,—Soya bean was originally used in the East to make a special sauce by a long process of fermentation. Years ago I obtained a big reaction to it in a Siamese patient who suffered from asthma. To-day it is imported by thousands of tons and is used in very many articles of food. In virtue of its whiteness it is the chief ingredient in salad cream, in wartime cream substitutes, especially in ice-creams. As a thickening agent it supplants wheat and cornflour in thick soups, gravies, and sauces. In the dry form it is found in many proprietary articles of food and may be in margarine.

Being in such general use soya bean should be on the list of common foods for which those treating allergy test their patients in the routine way. Recently I found a small child suffering from an infantile eczema to be particularly sensitive to this bean, responding with a very big reaction when tested by the scratch method. Unfortunately there is so much soya bean in use that avoidance is impossible and desensitization must be carried out as for dust and other unavoidable proteins.

In conclusion I think we may expect sensitization to soya bean to become of increasing importance.—I am, etc.,

London, W.1. FRANK COKE.

Flour in the Loaf

SIR,—In reply to Dr. Kent-Jones (May 5, p. 644) may I say that I am informed that foreign wheat is imported predominantly in the form of flour of 70 to 73% extraction, chemically bleached before export, and "containing no appreciable proportion of wheat germ" (*Hansard*, April 25, 1945). Wheat imported in the form of grain constitutes a smaller proportion of our whole supply, and home-grown wheat remains the principal source of wheat germ.

Home-grown wheat before the war constituted only 13% of our stock; wheat germ must therefore be very gravely restricted in quantity. My argument, and, I believe, Lord Portsmouth's as well, is that it is against the interests of the public, and especially those of the poorer classes, to divert one pennyweight of this precious commodity to any purpose other than the provision of the most nutritive national loaf that science can devise. The matter becomes even more serious when one realizes that the subsidy for the provision of the nation's bread has averaged £35,000,000 a year throughout the war years.

Dr. Kent-Jones and Mr. H. C. H. Graves give conflicting explanations for the source of the wheat germ distributed by the Ministry to certain vendors of patent products which are sold at a price rendering them accessible only to the well-to-do, who thus receive this provision of which the poor who need it most are deprived. Dr. Kent-Jones says that this quota is derived from the wheat flour supplied for the manufacture of "self-raising flour, biscuits, and confectionery," in the making of which, he says, the wheat germ would be destroyed, and it is therefore previously removed. I think Dr. Kent-Jones is likely to hear from the makers of biscuits, whose product is thus revealed as consisting, like the pre-war bread, almost wholly of starch! Dr. W. F. Cooper (May 5, p. 644) very justly asks why biscuits, which are so much used by all classes, should be thus deprived of wheat germ. Mr. Graves, in his letter in the *Journal* of March 31 (p. 460), declared that his product, Bemax, is prepared "solely from flour destined for manufacturing purposes," and he represented this use as "far-sighted and wise salvage." In an answer to me (April 25, 1945) the manufacturing purposes thus indicated are the production of "adhesives, leather dressings, and dry batteries." I find it difficult to credit the claim that the amount of wheat germ thus "salvaged" can be enough to explain the magnitude of the supply allowed for the patent products.

Dr. Cooper's comments are extremely pertinent. Statements of "rate of extraction" give no indication of what is extracted. As the germ constitutes only about 2–2.5% of the volume of the grain, it would be quite possible to have a flour of 97% extraction which could contain no germ, and thus be deprived of the constituents of which the germ is the richest source—e.g., vitamins, protein, minerals, etc.

The most authoritative experts on nutrition uniformly support Dr. Cooper's contention that there is no advantage (but very positive mischief) in taking anything out of the grain used for the national loaf. At a time when everything Russian received exaggerated adulation (even in the *B.M.J.*; vide Capt. Bateman's letter in your issue of May 4) it may profitably be noted that Russian soldiers have won their resounding victories on a diet mainly composed of whole-grain bread.—I am, etc.,

House of Commons. E. GRAHAM-LITTLE.

Persistence of Malaria Parasites

SIR,—The memorandum on the persistence of *Plasmodium ovale* by Sir Philip Manson-Bahr and Mr. W. J. Muggleton (March 17, p. 369) has just reached me. It is stated that the life span of *P. vivax* is three years when outside the endemic area (Shute, 1944). In this connexion it may be of interest to recall a case that I saw last winter in Lancashire.

The patient, a young naval rating aged 18, complained that he felt hot. Apart from this he felt perfectly well with no headache or symptoms pointing to any particular system. The temperature was 101° F. Clinical examination revealed no abnormality in any system; no splenomegaly or tenderness in the splenic area. The following day the temperature was 100.5° and he still appeared quite cheerful; clinical examination again n.a.d. A thin blood smear was made and stained by the Leishman method. It revealed a heavy infection with *P. vivax*. The patient said that he had returned from India when he was 10—that is, eight years ago. While in India he remembered having a mild attack of malaria. He had never been out of England in the meantime. On two occasions he had felt ill, but not ill enough to call in a doctor. He made an uninterrupted recovery once antimalarial therapy was started.

It would appear from this case that the malaria parasites had remained dormant in this patient, except possibly on two occasions, for eight years. Readers may remember that last winter was an unusually severe one in Great Britain, and that this was the cause of the relapse is more than probable.—I am, etc.,

ERNEST M. COCHRANE,
Surg. Lieut.-Cmdr., R.N.

Health Conditions in India

SIR,—I note with interest the comments by Dr. G. Arbour Stephens (May 5, p. 643) on the serious unhealthy conditions existing in India. No one in possession of facts should attribute the unhealthy conditions as being due to the determined opposition by the so-called vested interests (priests, landlords, or financiers) to any medical or public health reforms. It is purely a matter of mass illiteracy and extreme poverty. Unless these two are removed no amount of "complete rearrangement of medical services" will be of any use. I would like to add that there are, in the different Provinces of India, a large number of Government hospitals (where treatment is completely free) staffed by whole-time State medical officers, but even then the private medical practice flourishes very extensively. Why?—I am, etc.,

London, W.C.1. M. S. MOITRA, M.B., B.S.

Prolonged Minimal Doses of Sulphonamides

SIR,—Dr. Eadie in his letter on the prolonged use of minimal doses of sulphonamides (May 12, p. 680) suggests "their use in certain cases of pyelitis of pregnancy which are followed by relapse." He suggests this treatment may be continued until about "the 30th week of pregnancy, when the condition tends to resolve naturally."

His meaning is not quite clear. If he means that pyelitis of pregnancy resolves naturally about the 30th week, few people will agree with him. In the pre-sulphonamide days Crabtree saw only 3 such cases in 7 years, and at University College Hospital there were 2 among 84 patients. Since the introduction of sulphonamides the cure rate during pregnancy has considerably improved. Thirty-five out of 63 patients at University College Hospital had sterile urine after treatment for 6 to 7 days—the average dose was 10 to 15 g. Fifty of the 63 patients

were less than 30 weeks pregnant when they had their first attack of pyelitis, and 13 over 30 weeks pregnant. In 30 of these 50 patients the urine was sterile after a course of sulphonamides; 3 had a recurrence—one at the 32nd week and two at the 36th week. In 20 of the 50 patients the urine was not sterile after a course of sulphonamides; one patient had a recurrence at the 32nd week of pregnancy. Presumably it was to this last group of patients that Dr. Eadie would have given the small doses of sulphonamides, but in this small series the recurrence rate was higher among those in whom the urine had become sterile than among those who still had infected urine, and in both groups the recurrence occurred after the 30th week.

During the years 1927 to 1944 inclusive there have been 284 patients admitted with pyelitis of pregnancy: 197 were less than 30 weeks pregnant and 87 more than 30 weeks pregnant when the first acute attack occurred.—I am, etc.,

Obstetric Hospital, London, W.C.1. GLADYS DODDS.

An Examination Paper for Nurses

SIR,—We wish to protest emphatically against the examination paper on medicine and medical nursing treatment set in the recent final State examination by the General Nursing Council for England and Wales. In our view the examination paper was distinctly unfair for the following main reasons:

1. None of the questions concerned treatment or nursing.

2. Questions 2 and 3 required information about *investigations* of the causes of haematuria and dysphagia. Such investigations are highly technical, no part of a nurse's duty, and she would never have to undertake the responsibility of advising or performing them.

3. A paper consisting of one obligatory and one alternative question cannot be regarded as a reasonable test of a nurse's knowledge of medicine and medical nursing, even if the questions themselves were unexceptionable.

We feel very strongly that nurses should not be subjected to examination papers of this kind, which clearly demand information that could reasonably be expected only from those studying for medical qualification.—We are, etc.,

C. H. WHITTLE, L. B. COLE, Hon. Physicians.
L. C. MARTIN, Hon. Asst. Physician.
L. J. OTTLEY, Matron.
M. S. WELBON, Sister Tutor.
Lecturers to Nursing Staff.

Addenbrooke's Hospital, Cambridge.

Rheumatism and Orthopaedics

SIR,—Having taken a very small part in the formulation of the scheme of training suggested for physicians interested to make the study and treatment of rheumatism their life work, and which has been expanded by the committee of which Sir Adolphe Abrahams was the chairman, I am particularly interested in his report which you published (*Journal*, May 12). As an orthopaedist who has had a good deal to do with "rheumatism," perhaps I may be allowed to question the wisdom of Sir Adolphe's suggestion for substituting the title of "orthopaedic physician" for "rheumatologist." As he has shown so well in the explanatory section of his article, the word "rheumatism" is loosely used by laymen and doctors alike for almost any condition the cause of which is unknown. It is certainly undesirable to have a group of specialists called "rheumatologists" who, knowing more and more about aetiological obscurities, are perhaps going to dabble in a multitude of quasi-medical, quasi-surgical procedures. For—let me come quickly to the point—are we not really in need of more really good physicians: just simple honest-to-God physicians? The trouble is that the physicians, who recently have become so acutely aware of the seriousness of the problem of rheumatism in this country, have been inclined to judge of what is being done only by the standards of the large city general hospitals. Furthermore, in these quarters there is a tendency to place undue emphasis on the surgical aspects of the orthopaedist's work. It is true that for convenience the growth of orthopaedics has been largely within the arm of medicine called surgery, but it is a true example of a surgical science which has had to take a broad medical outlook, and its whole history is one of care for the whole patient rather than of one small part. The big city hospitals have little idea of what has been done over the past thirty years in the great provincial orthopaedic schemes founded by Sir Robert Jones and maintained by his followers. It would be better to call us "orthopaedists," for surgery is a relatively small part of our job. In connexion with rheumatism we do know a good deal about the human problem involved, and, in fact, in the regional orthopaedic schemes we have a very important organization which has anticipated the Empire Rheumatism Council's "Plan for National Action."

These provincial orthopaedic schemes have been prepared to assume the long-term treatment of chronic joint disease, to provide continuity of treatment in a special service in both hospital and dispersed out-patient clinic, having teams of expert technicians in orthopaedic nursing, physiotherapy, training, and rehabilitation. This has been done with unity of control. The whole problem has been considered in all its aspects, providing for the care of the patient as a whole by psychological encouragement in hopeful surroundings, planning for the prevention and correction of deformity and the maintenance and restoration of function. The protection of active joint lesions has been given with suitable apparatus and the graduation of activity: in other words, true physiological rest, with a follow-up scheme after leaving hospital to ensure so far as possible that treatment is maintained. In this milieu a most important possibility for training can be provided, and the scheme must be expanded to fill the deficiencies, which generally are in the direction of more beds and more staff. In the orthopaedic hospitals, what is needed is the help of more general physicians. They do not need to dabble much in orthopaedics. We are fully capable of doing that. There is nothing in the services of such a physician which cannot be provided by an interested general physician, as those of us know so well who are fortunate in having available such people.

One of the diseases of modern life is to invent new names for old things that people have lost the understanding of. Laziness of mind and failure to utilize past lessons are largely responsible for the present excitement about "rehabilitation." Let us be very careful before starting a new fad of the "orthopaedic physician."—I am, etc.,

Exeter. NORMAN CAPENER.

Cataract Surgery

SIR,—In a review of a book on cataract (May 12, p. 665) the statement is made that surgery "can do little for many patients who suffer from severe decline in vision without reaching the stage where operation is either justifiable or feasible."

Surely such a pessimistic view of modern cataract surgery is not in accordance with present-day clinical experience. The statement indicates an undue scepticism of the possibilities of cataract surgery. Operation is always both justifiable and feasible in the case of a patient, who suffers from severe decline in vision, at any stage, and it is difficult to imagine any reason, apart from complications unconnected with the eye, why operation should not be undertaken in such patients. It is to be hoped that we have passed the day when patients with senile cataract are asked to wait until the cataract is "ripe" before they can be relieved by surgery.—I am, etc.,

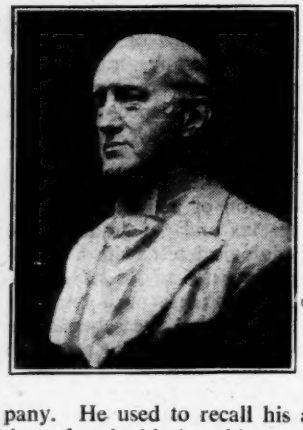
Edinburgh. H. M. TRAQUAIR, M.D., F.R.C.S.Ed.

The Ministry of Food wishes to draw the attention of doctors to the arrangements made whereby civilians who have been repatriated from enemy or liberated countries and whose health has suffered as the result of an inadequate diet can obtain extra milk and eggs. On production of a medical certificate at the food office stating that he is suffering from malnutrition, the patient will be authorized to obtain 14 pints of milk a week and shell eggs at the rate of three a week, for one month. At the end of this period the grant may, if necessary, be renewed for a further period of one month on submission of a fresh medical certificate to the food office. Separate arrangements have been made in respect of returned Service and Merchant Navy prisoners of war.

Obituary

SIR STANLEY WOODWARK, C.M.G., C.B.E., M.D., F.R.C.P.

Arthur Stanley Woodwark, who died on May 11, aged 70, was the third, and last survivor, of the six sons of the late George Woodwark, a North Riding man who had married a Norfolk lady, settled at King's Lynn, and become very prominent in the public life of that town and of Norfolk. Another of the brothers, the late Lieut.-Col. G. G. Woodwark, was for a time M.P. for the town. Four of the six were of gigantic stature, and Stanley, who stood six foot four or a little more, was the tallest of them all. He was born in 1875, educated at Felsted and St. Bartholomew's, whence he qualified as M.R.C.S., L.R.C.P. in 1902. He held resident posts at the Royal Free Hospital; and before that spent a short time as ship surgeon, during which he visited the Panama Canal works, then still under de Lesseps and his French company. He used to recall his amazement at seeing vast quantities of valuable machinery, not even uncased, hurled into a bottomless swamp in order that rascally officials could draw new commissions for further orders from rascally contractors. He first went into a partnership in general practice, but, conceiving that he had been unfairly treated by his senior, gave it up and decided to specialize in medicine. This meant going back to medical study: he took the M.B., B.S.Lond. with honours in both medicine and surgery in 1906, and the M.D. in 1909. He was casualty physician to St. Bartholomew's, medical registrar at King's College Hospital, and then was appointed assistant physician to the Westminster Hospital, where he was afterwards for many years a most efficient and popular Dean of the Medical School, and ultimately senior physician. In 1920 he became F.R.C.P.



While biding his time for consulting practice, Stanley Woodwark was a highly successful coach for examinations in medicine; when he epitomized his teaching in a *Manual of Medicine*, it soon ran through four editions. On the outbreak of war in 1914 he took a temporary commission as lieutenant in the R.A.M.C.; but not many weeks had elapsed when he was promoted in one jump to lieut.-colonel, at that time an almost unprecedented occurrence. Space forbids an account of his work at the War Office; it suffices to say that he ended the war as Colonel, Consulting Physician to the Army, C.M.G., C.B.E., with a recommendation for a knighthood (which led to nothing at the time). Both before and after the war, besides enjoying a wide consulting practice, he was much occupied in life assurance work for the Pearl and other offices, and was greatly in demand as an expert witness in compensation cases. His magnificent appearance, not diminished by his immaculate dress, combined with great care in getting up his facts and a strict impartiality in presenting them to the Court, impressed favourably both juries and judges alike.

In student days Woodwark had made some mark as librettist for concerts and pantomimes; in later years this facility bloomed into a talent for after-dinner speaking which put him in the top class of this difficult art; he was also a noted raconteur, with a pretty wit of his own. In 1911 he married Hilda, youngest daughter of the late Sir Richard Robinson. She survives him with two of their three sons and a daughter; it was generally conceded at the time that they were the handsomest couple in Harley Street, and their hospitality both there and at their country home at Cowden has been legendary for many years. He was knighted in 1932 for all-round public services; was D.L. and J.P. for London; Knight of St. John of Jerusalem; consulting physician to the Royal Waterloo and the Miller Hospitals; Master of the Apothecaries' Company for 1941–3; Master of the Turners Company for 1943, and of the Barbers for 1942–4; and a member of council of the Medical Defence Union. He had been examiner in medicine both for the Conjoint Board and for the L.M.S.S.A. He was also President of the Institute of Hygiene, and Governor of the Foundling and Westminster Hospitals. No account of him would be complete without a reference to the Savage Club, where he will be greatly missed; even in that society his personality was an outstanding one. He had been a member of the B.M.A. since 1907, but never sought election to the Council. Lady Woodwark has been chairman of the council of the Ladies' Guild of the Royal Medical Benevolent Fund after long service on the council and its committees.

S. INGLEBY ODDIE, M.B., C.M.

Samuel Ingleby Oddie, who died recently at the age of 76, was one of H.M. coroners for the County of London for 27½ years until his retirement in December, 1939: he had then held nearly 30,000 inquests and, to use his own words, had taken a real interest in crime and criminals for nearly 50 years.

He qualified medically (M.B., C.M.Ed.) in 1891 and spent his first few professional years as a naval surgeon. Then he entered private practice in Surrey, but found that it did not appeal to him. He left medicine and read law; he was among the top six candidates in the Bar Final and was called to the Bar by Middle Temple in 1901. He quickly established himself in his new surroundings and achieved a substantial practice on the common law and criminal side. Later he entered the chambers of Mr. (afterwards Sir) Richard Muir, who was one of the senior Treasury Counsel at the Central Criminal Court. Had Oddie desired to remain at the Bar he would certainly have attained eminence: probably the best-remembered case in which he was one of the counsel for the Crown was the prosecution of "Dr." Crippen for murder. But (as he himself has told in his book of reminiscences *Inquest*) Oddie had always wanted to be a coroner. The chance came in 1912, and he was appointed coroner to South-West London and to the City and Liberty of Westminster; the Westminster appointment was made by the Dean and Chapter, and this was the last occasion of the exercise of the franchise, which had been extant for 800 years; the right has now disappeared.

As coroner, Ingleby Oddie became an outstanding example of the right man for that office. His basic medical education, his appreciation and knowledge of everyday affairs, and (perhaps above all) his experience in the actual practice of law gave him a background that placed him in a class by himself. He realized that the duty of the coroner is not, as is sometimes wrongly said, merely to find the cause of death: it is to ascertain by evidence when and by what means the deceased came to his death. When in court Oddie was alert; the proceedings never dragged. He had both clarity and strength of mind; he hated subterfuge in any form; he did not hesitate to express, if his were the verdict, what he believed to be the facts. He was popular among his colleagues and gave great service to the Coroners' Society of England and Wales, being president from 1925 to 1927—a period of importance in view of the coming into operation of the Coroners (Amendment) Act, 1926, which effected considerable changes in procedure.

This versatile, genial, and kindly man had a keen sense of humour which he turned against himself at times. His own account of his departure from the scene of his private practice was that he set up his top hat on the garden path, took a running kick at it, and left. Again, at the age of 63, he found it necessary to have a tooth removed: before his dental appointment he held one inquest, and this happened to be a death in a dental chair; Oddie used to recount how this rare event put him in a suitable frame of mind at once.

He had other interests apart from his professional duties—architecture, book reading, crosswords—and he was an accomplished croquet player. He was a good friend and a most entertaining companion. Despite the twinges of ill-health since his retirement (which was a matter of regret to him at the time) he well maintained his capacity for expression in letters to his friends. He is survived by his wife and by his son, Ripley Oddie.

W. B. P.

GARNETT WRIGHT, F.R.C.S.

Mr. J. B. MACALPINE writes:

The sudden death of Mr. Garnett Wright removes one of the best beloved and capable of Manchester consultants, and severs a link with the Salford Royal Hospital which had lasted for nearly 35 years. Having previously served a short time as honorary surgeon to the Ancoats Hospital, Manchester, he transferred to the Salford Royal Hospital in 1910, and since 1918 had been its senior surgeon. Just before the commencement of the present war Wright reached the age of 60 years, and according to the rules of the hospital, which provide for retirement by stages up to the age of 65, he had lost one-half of his beds. With the altered conditions produced by loss of honorary staff owing to the war Garnett Wright shouldered afresh the responsibilities of a whole surgical unit, and, though in the latter years the strain was obviously telling, he held manfully to his post until within a day or two of his death. Only a month ago he had bought a house in his native county (Cumberland) to which he hoped to retire this summer.

Wright's principal operative field was the abdomen, though he was also interested and successful in the surgery of the thyroid. His surgery was essentially practical, sound, and direct, and his results would probably stand comparison with those of the most successful. He had a flair for diagnosis, and even though he never acquired a widespread practice his judgment and advice were much in demand by colleagues and friends. Though anything but easy-going in his general surgical work he acknowledged to a certain indolence in the matter of contributions to surgical literature, with the result that though a handful of valuable papers have come from his pen much of the results of his wide experience are not recorded. This is the more regrettable as his mind was pre-eminently accurate, observant, and trustworthy.

Garnett Wright will long be remembered for his kindly ways and his ready help and advice when, as often, it was asked for. His sound realistic help and counsel were frequently sought by members of our profession not only in professional but also in personal affairs, and his judgment was rarely at fault. Customarily gentle and generous to a degree, he could be brusque and forthright if a matter of principle appeared to be involved, he himself being one of the most sincere and upright of men. He was a good committeeman and a wise liaison officer between the administrative and medical boards of the hospital: in the counsels of each his opinion carried much weight. Even though we realized that his retirement was imminent his passing leaves a blank not only at the hospital but in a wide circle of affectionate and appreciative friends.

We regret to announce the death on April 18 at Wrington, Somerset, of Dr. H. C. BRISTOWE, son of Dr. John Syer Bristowe, at one time senior physician to St. Thomas's Hospital, London, and the author of a well-known textbook on medicine. Hubert Carpenter Bristowe received his medical education at St. Thomas's Hospital, qualifying M.R.C.S., L.R.C.P. in 1888, and taking the M.B.Lond. in 1889 and the M.D. in 1890. After a number of hospital appointments he started in practice at Wrington in 1892 and remained there until he retired in 1926. He then took up work as a medical referee in connexion with National Health Insurance. Dr. Bristowe had a fine record of work for the B.M.A. He was on the Council from 1919 to 1933, and his record of committee work is very extensive: the Central Ethical Committee from 1920–31; Medico-Political Committee, 1920–31; Maternity and Child Welfare Subcommittee, 1920–30; Post Office Medical Advisory Subcommittee, 1923–31; Prison Medical Officers Subcommittee, 1925–7; the Assistant Asylums Medical Officers Subcommittee, 1926–9; the Psycho-analysis Committee, 1927–9; the Mental Deficiency Committee, 1930–2; and the Private Practitioners and Mental Illness Treatment Committee, 1931–2. While playing no particularly spectacular part he was always regarded as a sound adviser and a good committeeman. In 1931 he convened the inaugural meeting of the East Somerset Division, Bath and Bristol Branch, of the B.M.A., and was its first chairman. He was a Representative from 1917 to 1923, from 1925 to 1932, and again from 1934 to 1936. For some years he was chairman of the Somerset Local Medical and Panel Committee. Dr. Bristowe was much interested in Freemasonry and took a leading part. Among the many offices he held were those in Grand and in Somerset Provincial Grand Lodges; he was also a member of the Somerset Masters Lodge and Past Master of the Lodge of Agriculture. In professional life he was highly regarded by his patients for his wide knowledge and the care and skill he gave to them, for behind an occasional brusqueness of manner he was a very warm and kind friend who instilled great confidence.

We regret to announce the death on May 4, at 32, Oakley Street, Chelsea, of Dr. EDMUND FAIRFIELD THOMAS, aged 61. He was M.D.Bristol, M.D.Brux. (Hons.), M.R.C.S., L.R.C.P., L.S.A., D.P.H. with honours. Though for long in general practice his chief interest lay in the prevention and treatment of tuberculosis, and he wrote a "History of the Anti-tuberculosis Movement in Wales" which appeared in the *British Journal of Tuberculosis* in 1911. He was one of the first school medical inspectors in Wales, and the first tuberculosis officer to be appointed in that country. He founded the first municipal dispensary for the treatment of consumption. During the 1914–18 war Dr. Fairfield Thomas served with distinction as a naval surgeon with the Dover Patrol and the Grand Fleet. He was a well-known and highly respected figure in Chelsea, and during the present war he rendered steady service in the air raids in the borough. He was an active Freemason and a Past Master of the Middlesex Hospital Lodge. Dr. Fairfield Thomas was an ardent worker for the B.M.A., of which he became a member in 1906, and was for many years the life and soul of the Chelsea Division. He was chairman of the Division from 1933 to the time of his death, and represented it at the Annual Representative Meetings 1921–6, again in 1930, 1932, 1941, and 1943. He leaves a wife and two sons, the elder of whom is continuing the practice.

On May 10, his 83rd birthday, Dr. JAMES HERBERT MENZIES, of South Kensington, died in the house where he had carried on practice for a very long period of years; indeed, when he retired he was probably the senior in standing of any practitioner in that district. He was a brother of the late Dr. H. H. Menzies, of Westminster; both the brothers had been cricketers of more than common skill, though J. H. had not quite the same reputation as H. H., who was a Middlesex county player. He was trained at St. Bartholomew's Hospital Medical School, whence he became M.R.C.S., L.S.A. in 1884. Thereafter he did resident appointments at the West London Hospital before settling in general practice in Kensington. During the 1914–18 war Dr. Menzies held a number of part-time appointments in temporary war hospitals. A man of quiet disposition and very strictly upright and honourable principles, he gained the respect and affection not only of a wide circle of patients but of his professional colleagues as well. His impressive figure and dignified bearing will be much missed in the Hereford Square neighbourhood.

Dr. KENNETH JAMES WILLIAM CRAIK has died in Cambridge as the result of a cycling accident at the early age of 31. A brilliant psychologist, he had done valuable work on behalf of the fighting Services. He went to Edinburgh University from the Edinburgh Academy and graduated M.A. with first-class honours in philosophy in 1935. He gained the Hamilton Fellowship and in 1936 the Shaw Philosophical Fellowship, and then went to St. John's College, Cambridge, for a research course, leading to the Ph.D. in 1941 for his thesis in physiological psychology entitled "Visual Adaptation." He was elected a Research Fellow of St. John's in 1942, and during the war did research work for the Air Ministry and other Service Departments. In 1944 the Medical Research Council appointed him director of its Unit for Applied Psychology at Cambridge. Dr. Craik was the author of a book, *Nature of Explanation*, published by the Cambridge University Press two years ago, and of articles in the scientific journals, including a paper on "Specifications for Dark-adaptation Tests," published in the *British Medical Journal* of May 22, 1943. He was a Fellow of the British Psychological Society and a member of the Physiological Society. His untimely death robs science of a worker who had already done much for his country and for the application of psychological knowledge to particular problems.

Mr. A. P. Bertwistle writes: May I add to your obituary notice of Mr. LAWFORD KNAGGS a few observations on the man. Your note dealt with his work. He was above all a gentleman whose rugged, gaunt exterior hid a heart of pure gold. In Leeds he always gave the impression of being a lonely man whose sole object in life was the curing of disease. In the last world war, no matter at what time of the night the convoys of wounded arrived he was there to welcome them with a smile of encouragement. His large hands were gentleness personified. A fellow student of mine, R. Graham, who broke his femur, declared that "Pa" Knaggs—as he was affectionately called—was the only one who could examine a fracture without pain. While his book on bone was a magnificent piece of work, a series of about half a dozen more articles on bone disease in the *British Journal of Surgery* were even finer. His command of the English language was perfect and he was scrupulously careful in his use of words. I, personally, shall miss him greatly, as no accounts of bone were published in *A Descriptive Atlas of Radiographs* without his approval.

Universities and Colleges

ROYAL COLLEGE OF SURGEONS OF ENGLAND

Gift from the B.M.A.

As announced in the Annual Report of Council printed in the *Supplement* of May 12, the Council of the British Medical Association has contributed 1,000 guineas from Association funds to the Restoration and Development Fund of the Royal College of Surgeons. Since then the Secretary of the Association has received the following letter from Sir Alfred Webb-Johnson, President of the College:

MY DEAR DR. HILL,

I beg to acknowledge with thanks the receipt of your letter informing me that the British Medical Association is making a donation of one thousand guineas to the Restoration and Development Fund of the Royal College of Surgeons. This spontaneous gesture is very deeply appreciated by my Council, and it will be welcomed by all the Fellows and Members of the College.

It is a great encouragement to us in our work to receive the support of your great Association, which is representative of the whole medical profession. The gift is welcome not only for the substantial help which it will give towards the objects we have in view, but also as further evidence of the cordial relations between the Association and our College. It has been one of the happiest experiences of my period of office as President of the College to have had such friendly relations and such fruitful co-operation with the British Medical Association.

I would like you to assure your Council that my colleagues and I are deeply grateful for this gesture of friendship and for the Association's support of the high ideals for which our College stands.

Yours very sincerely,
ALFRED WEBB-JOHNSON.

Council Meeting

At a meeting of the Council of the College, held on May 10, with the President in the chair, Dr. R. A. Willis, who had arrived from Melbourne, was admitted as the first Sir William H. Collins Professor of Human and Comparative Pathology. The Hallett Prize was awarded to William Burnett, of the University of Aberdeen. The British Association of Urological Surgeons was added to the list of those specialist associations who enjoy the facilities of the joint secretariat at 45, Lincoln's Inn Fields.

Diplomas of Membership were granted to the 139 successful candidates whose names were published in the report of the meeting of the Royal College of Physicians of London in the *Journal* of May 5 (p. 647).

Diplomas in Medical Radiodiagnosis and in Medical Radiotherapy were granted jointly with the Royal College of Physicians of London to J. A. Ireland and L. M. Shorvon respectively.

Lister Medal

The Lister Medal for 1945, which is awarded in recognition of distinguished contributions to surgical science, has been granted to Sir Howard W. Florey, F.R.S., of the University of Oxford, for the outstanding importance to surgical science of his work on penicillin and its application. He will deliver the Lister Memorial Lecture later in 1945. This is the eighth occasion of the award, which is made by a committee representative of the Royal Society, the Royal College of Surgeons of England, the Royal College of Surgeons in Ireland, the University of Edinburgh, and the University of Glasgow.

UNIVERSITY OF GLASGOW

The King, on the recommendation of the Secretary of State for Scotland, has appointed Prof. William James Hamilton, M.D., D.Sc., to the Regius Chair of Anatomy at Glasgow University. After a distinguished career at Queen's University, Belfast, Prof. Hamilton went to Glasgow in 1930 as demonstrator of anatomy, and two years later was appointed lecturer. In 1935 he became lecturer at St. Thomas's Hospital Medical School, and since 1936 has held the Chair of Anatomy in the University of London tenable at St. Bartholomew's Hospital Medical College.

The Services

CASUALTIES IN THE MEDICAL SERVICES

Died.—Capt. James Alexander Harper, R.A.M.C.; War Subs. Capt. Clarence Wilfred O'Donoghue, R.A.M.C.

Missing, presumed killed.—Temp. Surg. Lieut. John Nairn Lennox, R.N.V.R.

Died of wounds.—War Subs. Capt. Thomas Joseph Seavers, R.A.M.C.

Medical Notes in Parliament

Alien Doctors

Answering Sir Walter Smiles on May 11, Mr. HERBERT MORRISON reported that some of the foreign doctors admitted temporarily to this country had already returned. Others were preparing to leave. He said the remainder still render valuable service in this country, where, for the time being, there was an extreme shortage of medical man-power.

Sir WALTER SMILES suggested that, as numbers of British medical students had been sent to work in Europe, the Minister should consider returning some foreign doctors to their native countries.

Control of Flies on Sewage Filter

On May 11 Sir JOHN MELLOR asked what reports the Minister of Health had received concerning the nuisance from flies in the sewage filter beds of the Birmingham Tame and Rea District Drainage Board. Mr. WILLINK replied that the most recent report from the Drainage Board, received a little over a week ago, was that the flies were not more numerous than in recent years, though their emergence appeared to have been accelerated by an early spell of warm weather. A group of experts formed under the Department of Scientific and Industrial Research in 1943 had directed extensive observations both at the Drainage Board's works at Minworth and at a number of other sewage disposal works. Much detailed information had been collected on the distribution and life history of flies in percolating filters and on their reaction to variations in such factors as the composition and temperature of the settled sewage and the alternation of periods of operation and rest of the filters. Further investigation was in progress on the control of the emergence of flies by chemical substances, and on alterations in the construction and method of operation of filters. The effect of treating the sewage at a greatly increased rate in percolating filters was also being investigated. Measures were applied by the Drainage Board from time to time to alleviate the conditions, including treatment of the sewage by gas liquor, by salt, and by a number of chemicals, a large-scale application of bleaching powder and creosote, and an attempt to trap the flies by mechanical means. The problem was difficult, largely because the larvae of the flies constituted an important element in the efficient operation of the filters. Control must therefore be restricted to the emergence of the adult flies without destroying the biological life within the filters.

Poliomyelitis in the Army

On May 15 Sir JAMES GRIGG, replying to Mr. Rhys Davies, said that the incidence of infantile paralysis in the Army since the beginning of the war had not yet been worked out. The incidence of this disease was low, and from the general man-power viewpoint insignificant. Current statistics were not therefore maintained, and it would not be justifiable at present to divert the limited statistical staff from more important work to have this incidence worked out. It was, however, hoped that details would eventually be published in the *Medical History of the War*. As the disease occurred in small sporadic outbreaks, and as the source and transmission of the virus were not yet known, it was not possible to say to what extent special preventive measures employed were responsible for the cessation of an outbreak compared with, for example, natural or climatic conditions. No remedy for the disease as such was known. The damage to the nerve cells attacked by the virus occurred at once and was irremediable. Once the infective process had been arrested, however, a very great deal could be done by physiotherapy and by orthopaedic surgery to re-educate partially affected muscles or muscles which had deteriorated through inactivity. During the acute period iron lungs were used to replace damaged respiratory muscles.

Tuberculosis Waiting List in Scotland

On May 15 Mr. MCINTYRE asked the Secretary of State for Scotland how many patients suffering from pulmonary tuberculosis were at present awaiting beds in hospitals in Scotland as a whole, and in Glasgow, respectively; and what steps he proposed to take to bring an immediate end to this situation. Mr. JOHNSTON in reply said that at March 31, 1945, 1,770 persons in Scotland suffering from pulmonary tuberculosis were awaiting admission to hospital. Of this number 1,142 were in Glasgow. The Department had provided 758 beds from the Government's Emergency Hospital Scheme, and the number of patients undergoing hospital treatment for pulmonary tuberculosis in Scotland had already been increased by over 60% since the war began. Further beds could be made available but there was a serious shortage of nursing staff and there were obvious difficulties in compulsorily directing girls to the service.

On this problem he was in constant touch with the Minister of Labour, and he hoped that this question and answer would draw public attention to the desirability of more volunteers being rapidly forthcoming for the nursing of tuberculous patients.

Availability of Penicillin

On May 15 Mr. SALT asked the Lord President of the Council whether he was aware that penicillin was now on sale at every drug store in the U.S.A. and was advertised for sale there as freely as cosmetics; and what steps it was proposed to take to ensure that in the early future facilities were provided in Great Britain for at least the partial development of British discoveries and inventions such as penicillin. Sir JOHN ANDERSON: It will be part of the responsibilities of the Department of Scientific and Industrial Research in the future to keep watch, with the help of other Departments, in specialised fields such as medicine for promising results of British research which merit development in the national interest, and where such development appears to be lagging behind appropriate steps will be taken for its encouragement.

Mr. LEVY asked if the manufacture of this product was a monopoly in this country. Sir JOHN ANDERSON replied that he did not think there was any monopoly in the matter.

Deaths after Vaccination in Scotland.—Mr. JOHNSTON, replying to Mr. Viant on May 8, said that according to the records of the Registrar-General for Scotland two deaths were registered in 1943 as attributable to consequences of vaccination, the causes of death being post-vaccinal encephalitis and post-vaccinal myelitis, and the ages at death were 15 and 51 years respectively.

EPIDEMIOLOGICAL NOTES

Discussion of Table

In *England and Wales* during the week there was a general fall in the incidence of infectious diseases as follows: measles 2,884 fewer cases, whooping-cough 140, scarlet fever 75, diphtheria 10, dysentery 17.

Durham had 15 fewer cases of diphtheria, Glamorganshire 15, and Lancashire 14. In Lancashire notifications of whooping-cough fell by 37 and of scarlet fever by 58. The measles epidemic is subsiding in most areas of the country, and notifications were lower than last week by the following figures: Yorks West Riding 616, Surrey 264, Essex 263, London 243, Middlesex 202; there were increases of 189 in Kent, 79 in Cornwall, and 76 in Southampton.

For the second successive week there was a small decrease in the incidence of dysentery. The largest returns were Lancashire 54, London 51, Warwickshire 45, Gloucestershire 31, Kent 27, Hertfordshire 24, Yorks West Riding 21, Pembrokeshire 20, Staffordshire 20, Middlesex 17, Essex 14, Shropshire 14, Devonshire 12, Norfolk 11, Northumberland 11.

In *Scotland* whooping-cough notifications fell by 52 cases, those of diphtheria by 33, and those of dysentery by 15, while those for cerebrospinal fever increased by 12. Diphtheria is now at the lowest level for several months. Dysentery is still prevalent, the largest returns being Glasgow 51, Edinburgh 39, Aberdeen Burgh 19, Dundee 11, Falkirk 10, Aberdeen County 10.

In *Eire* there was a fall of 31 in the notifications of diphtheria; 21 of the 73 cases were reported from Dublin C.B., and the other 52 involved thirty areas.

In *Northern Ireland* only 8 cases of diphtheria, a fall of 14, were notified. An increase of 16 was recorded for scarlet fever.

Scottish Vital Statistics

The preliminary review of the first quarter of 1945 shows a large fall in the birth rate, which was 16.9 per 1,000, the lowest ever recorded for a first quarter. The infant mortality was 68 per 1,000 births, and was the lowest rate for the first quarter of any year. The death rate, 14.6 per 1,000, was 0.7 above the rate for the corresponding quarter of 1944, but 1.9 below the five-years average. The marriage rate, 7.6 per 1,000, was 0.6 above the rate for the March quarter of 1944.

Typhus in P.O.W.

There are 8 or 10 cases of typhus or suspected typhus among prisoners of war returned to this country. The disease was contracted in Germany, and there have been no secondary cases. In any case of pyrexia of unknown origin practitioners should bear in mind the possibility of typhus.

Week Ending May 12

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 1,365, whooping-cough 799, diphtheria 413, measles 12,412, acute pneumonia 511, dysentery 343, paratyphoid 3, typhoid 4.

No. 18

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended May 5.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1945 (a)	1945 (b)	1945 (c)	1945 (d)	1945 (e)	1944 (Corresponding Week) (a)	1944 (b)	1944 (c)	1944 (d)	1944 (e)
Cerebrospinal fever	50	7	30	1	1	72	6	25	2	1
Deaths		1	—				2	—		
Diphtheria	504	14	93	73	8	548	25	171	85	22
Deaths	9	—	4	1	1	12	2	1	1	—
Dysentery	469	51	173	1	1	259	30	91	—	—
Deaths				—	—				—	—
Encephalitis lethargica, acute	1	—	2	—	—	4	—	1	—	—
Deaths		—					—			
Erysipelas			38	10	5			35	7	2
Deaths		1					—			
Infective enteritis or diarrhoea under 2 years				16					7	
Deaths	61	8	10	15	5	36	8	9	10	4
Measles*	13,139	815	355	68	21	2,035	213	454	166	11
Deaths	12	2	1	1	1	2	—	1	1	—
Ophthalmia neonatorum	62	5	14	—	—	98	3	23	—	—
Deaths										
Paratyphoid fever	7	—	2(B)	—	—	4	1	14(B)	2(B)	—
Deaths	—	—	—	—	—	—	—	—	—	—
Pneumonia, influenzal†	518	27	8	2	3	680	49	2	4	2
Deaths (from influenza)	10	1	1	—	—	13	1	1	1	—
Pneumonia, primary			174	26				198	26	
Deaths		22		7	8		27		10	8
Polio-encephalitis, acute	1	—				2	—			
Deaths		—					—			
Poliomyelitis, acute	7	—	—	—	—	12	1	1	—	—
Deaths		—					—			
Puerperal fever		2	14		—		3	18		—
Deaths										
Puerperal pyrexia‡	116	11	19	2	—	151	11	12	1	3
Deaths		1					—			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	1,351	70	205	9	50	1,646	115	191	25	82
Deaths	1	1	—	—	—	—	—	—	—	—
Smallpox	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Typhoid fever	3	1	4	6	1	5	—	3	19	2
Deaths	—	—	—	—	—	—	—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Whooping-cough*	1,050	46	149	52	23	2,432	247	187	43	13
Deaths	5	—	3	3	—	16	5	1	2	1
Deaths (0–1 year)	356	39	64	40	20	359	47	66	37	24
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	4,280	568	589	244	130	4,233	635	571	183	133
Annual death rate (per 1,000 persons living)			13·4	15·7	§			13·1	11·9	§
Live births	6,376	666	854	399	276	7,211	869	1,002	563	294
Annual rate per 1,000 persons living			17·1	25·7	§			20·4	—	§
Stillbirths	190	11	35			234	26	32		
Rate per 1,000 total births (including stillborn)			39					31		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.

† Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

‡ Includes puerperal fever for England and Wales and Eire.

§ Owing to evacuation schemes and other movements of population, birth and death rates for Northern Ireland are no longer available.

Medical News

The St. Cyres Lecture for 1945 will be delivered in the Barnes Hall of the Royal Society of Medicine (1, Wimpole Street, W.), on Wednesday, June 6, at 5 p.m., by Prof. J. Crighton Bramwell. His subject is "Coarctation of the Aorta." All members of the medical profession are invited to attend.

A general meeting of the Medical Society for the Study of Venereal Diseases will be held at 11, Chandos Street, W., to-day (Saturday, May 26), at 2.30 p.m., when "Treatment of Infective Arthritis, with Special Reference to Hyperthermia" will be discussed by Lieut.-Col. A. J. King and Majors C. S. Nicol, D. I. Williams, and J. Louden.

The meeting of the Nutrition Society to be held to-day (Saturday, May 26) at the London School of Hygiene and Tropical Medicine will be devoted to nutritional factors in wound healing. The chairman of the morning session will be Prof. H. P. Himsworth, and of the afternoon session Prof. J. R. Learmonth. Dr. D. P. Cuthbertson will open the discussion at 12 noon with a paper on dietary protein in relation to convalescence from injury. In the afternoon papers will be read on vitamin C and wound healing, the speakers including Drs. J. F. Danielli, H. B. Fell, E. Kodicek, P. D. F. Murray, and Geoffrey H. Bourne. Non-members are admitted to meetings of the society only by introduction of a member.

Mr. Eardley Holland's Chadwick Lecture on "The Importance of a Maternity Service in the Life of the Nation" (postponed from May 8) is to be delivered on Tuesday, May 29, at the Royal Society of Tropical Medicine and Hygiene, 26, Portland Place, W. Immediately before the lecture (at 2.15 p.m.) the Chadwick Prize of £100 and a gold medal is to be presented by the chairman of the Chadwick Trustees, Sir William J. Collins, to Surg. Capt. S. G. Rainsford, M.D., D.Sc., R.N., who will be introduced by the Medical Director-General of the Navy. Admission to all Chadwick Lectures is free, without ticket.

A meeting of the Section of Epidemiology and State Medicine of the Royal Society of Medicine will be held at the R.A.F. Station, Halton, Bucks, on Friday, June 1, at 3 p.m., when an introductory address will be given by Air Marshal Sir Harold Whittingham, Director-General of Medical Services of the R.A.F. On the same day the combined summer meeting of the Sections of Laryngology and of Otology will begin at 1, Wimpole Street, W., at 10.30 a.m., with a demonstration of R.A.F. hearing tests for use in the selection of flying personnel. Papers will be read in the afternoon, from 2.30 p.m., and the combined meeting will continue its business on Saturday, June 2.

The Socialist Medical Association has arranged a meeting to be held at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C., on Saturday, June 2, at 3 p.m., when Prof. J. A. Ryle will speak on "Health Problems of British India."

Lord Moran, P.R.C.P., will give an address on "Courage and Fear" before the Royal Institution (21, Albemarle Street, W.) on Friday, June 8, at 5 p.m.

The Association of Industrial Medical Officers has arranged a meeting at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C., on Saturday, June 9, at 2 p.m., when private business will be discussed. At 2.30 p.m. Mr. S. H. Wilkes will speak on "Protection against Industrial Poisoning."

The January issue of the *Annals of Internal Medicine* is devoted to the epidemiology of acute respiratory infections conditioned by sulphonamides. The March issue of the *Journal of Pediatrics* contains a symposium on rheumatic fever.

Boots Pure Drug Company Limited announce that Sir Jack Drummond, D.Sc., F.R.S., chief scientific adviser to the Ministry of Food, has been appointed to the post of director in charge of the whole of the company's scientific research. Sir Jack Drummond has resigned the chair of biochemistry at University College, London, but will not take up his new appointment until the food situation has improved.

The freedom of the borough of Paddington was conferred last week on Sir Alexander Fleming, F.R.S., as a token of the high esteem in which he is held by the civic authority of the borough where he has carried out, at St. Mary's Hospital, his scientific researches and in which his discovery of penicillin was made.

From Dr. Ralph Pemberton, President of the Pan-American League against Rheumatism, Lord Horder has received a letter congratulating the Empire Rheumatism Council on the decision of the British Government to make, in post-war health policy, adequate provision for the treatment of rheumatic sufferers. Dr. Pemberton adds, "This will influence thought everywhere."

Letters, Notes, and Answers

All communications with regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1. TELEPHONE: EUSTON 2111. TELEGRAMS: *Aitiology, Westcent, London.* ORIGINAL ARTICLES AND LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

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ANY QUESTIONS?

Lead Palsy

Q.—*Is there any explanation of the fact that the supinator longus muscle is not involved in radial nerve paralysis due to lead poisoning? Also, why are sensory nerve changes uncommon in this type of poisoning?*

A.—The explanation is that the lesion in lead palsy is not in the peripheral nerve. Aub and his collaborators showed that the lactic acid liberated in muscles by their contraction leads in the presence of lead phosphate to the precipitation of insoluble lead phosphate in the muscle cells, and selective muscular paralysis has been experimentally produced by fatiguing certain muscles. The condition is therefore is a toxic myopathy. In painters the extensors of the wrists and fingers, being most used, suffer most, and the supinator longus escapes.

Micturition

Q.—*In the erect posture the internal urethral orifice is situated in the most dependent part of the bladder. How can this be reconciled with the fact that in haematuria of bladder origin and in phosphaturia it is the urine which is passed at the end of micturition which is most heavily blood-stained and most heavily laden with phosphates respectively? One would expect deposits of blood and phosphates to be passed with the first fraction of urine voided. What is the explanation?*

A.—The probable though unproved explanation is as follows. As the bladder fills the base behind the inter-ureteric bar sinks and becomes the lowest part of the viscus; in this region, and particularly to right and left of the middle line, debris tends to accumulate. On micturition it is obvious that the urine most adjacent to the internal meatus is the first to be expelled. If a bladder is watched through a flushing cystoscope whilst it is being allowed to drain, it will be seen that the superior part descends, the wall becoming convex into the cavity during this process. Thus the cavity is gradually obliterated from above downwards—though of course local contracture towards the mid-point also occurs. This mid-point is the internal meatus, and when the bladder is almost empty the form of the cavity may be compared to the letter T, but one with the cross not horizontal. The stem represents the prostatic urethra; the anterior part of the cross is the bladder lumen anterior to the meatus, and this is turned upwards; the posterior part of it is the retromeatal region, and this is turned downwards. On cystoscopy the adjacent part of the bladder cavity lying behind the inter-ureteric bar can be seen to be the last to empty. Stasis of its contents may also be due to special fluid currents set up during micturition, but so far as is known these have not been demonstrated.

Erythrocytosis in Disease

Q.—*Erythrocytosis is said to occur in certain types of visceral syphilis, and occasionally in pituitary basophilism. What is the explanation in each of these two disease processes?*

A.—Erythrocytosis has been described in a number of conditions in which there is enlargement of the liver and/or spleen—e.g. cirrhosis of the liver, tuberculosis of the spleen, and lymphadenoma and visceral syphilis should probably be included in this group. The mechanism responsible for the erythrocytosis is not known, though it is noteworthy that clubbing of the fingers may also occur. The explanation of erythrocytosis in pituitary basophilism is also unknown, and it has not been possible to reproduce the condition in experimental animals.

Urticaria Again

Q.—*Are peptone injections of use in the treatment of urticaria?*

A.—Urticaria is usually considered nowadays to be an allergic manifestation due to a sensitivity on the part of the sufferer to various drugs (aspirin, phenolphthalein, sulphonamides), envir

mental articles (feathers, dusts, animal hairs, powders, oils), foods or physical agents (heat, cold, light, friction). Formerly it was only considered due to a sensitivity to foods of protein origin, and when food skin tests and dietary experiment and eliminations did not improve the disorder, a protein product (peptone) was chosen for injection and given in increasing doses with the hope that it would bring about a non-specific desensitization. Now that the greater importance of drugs, feathers, dust, animals, and physical agents is realized, their avoidance and specific desensitization offer a greater hope of cure.

Filtering Entamoeba histolytica from Water

Q.—*What type of filtration will remove cysts of Entamoeba histolytica from water?*

A.—I find this question a little difficult to answer. There is the possibility that the questioner may be referring to the removal of cysts of *Entamoeba histolytica* either on a large scale, such as for water supply, or on a personal or domestic scale. If the former, any of the standard processes used for purification of water supplies, such as sand filters worked at the rate of four inches per hour, the more rapid mechanical filters, in which sulphate of alumina is used, or the Candy type of filter, would all be an efficient means of preventing the passage of cysts of *Entamoeba histolytica*. On the domestic scale any of the small filters, the basis of which is the use of infusorial earths, clays, porcelain, or combinations of porcelain with clay, would be equally efficient. The efficiency of all these filters is mainly dependent on the pore size of the filtering material, and the comparatively large size (5–20μ) of the cysts of *Entamoeba histolytica* makes it impossible for them to traverse an efficiently working filter of any type.

Treatment of Inevitable Abortion

Q.—*What, in your opinion, is the best treatment for an inevitable abortion? I am frequently called to such cases and usually find an incomplete abortion with a very fair haemorrhage. Do you advise attempting digital removal of the remains before sending to hospital for dilatation and curettage? Do you advise giving pituitary to these cases before removal of the debris?*

A.—For the uncomplicated case, put the patient to bed, protect the vulva with a sterile pad, give morphine or omnopon—partly to relieve pain and partly to allay anxiety—and allow the abortion to proceed without any local interference. The only indications for active intervention are: (*a*) excessive bleeding, (*b*) infection, or (*c*) retention of part of the products of conception. In the last instance, and particularly if the whole placenta is retained, there is no need for immediate exploration of the uterus unless haemorrhage or pyrexia supervenes. In the absence of such it is safe to wait one or two days in the hope of spontaneous expulsion. During that time pituitary extracts may be administered without risk—as they may during the process of complete abortion or during operation for incomplete abortion. Oxytocin (5 units intramuscularly) is perhaps preferable to pituitrin.

Complete removal of all retained products of conception with any degree of certainty and safety requires digital exploration of the uterus, the patient being anaesthetized and under hospital conditions. To carry out what would probably be a partial removal, before transferring the patient, only increases the risk of infection and puts the patient to unnecessary discomfort; it is not very likely to allay bleeding and might even increase it. Even vaginal examination should be avoided if possible. It should be added that when the patient is exsanguinated and shocked blood or plasma transfusion should be carried out before she is sent to hospital. Indeed in the more serious cases of haemorrhage the whole treatment, including digital evacuation of the uterus, is probably best carried out without moving the patient from her home, but expert assistance and suitable equipment should be available.

Fibrous Nodules in Arthritis

Q.—*A patient with rheumatoid arthritis has several fibrous nodules in the gluteal muscles. They are from 1/2 to 3/4 in. in diameter. They are not tender in themselves but evidently transmit pressure to tender subjacent structures when the patient is in the sitting position. Soft rubber pads strapped to the skin cause some relief but are difficult to keep in place. What treatment is recommended, and is any form of physiotherapy likely to be of use?*

A.—Fibrous nodules in the gluteal muscles are not common in rheumatoid arthritis and are difficult to deal with; surgical removal is worth consideration but is often difficult, and fresh nodules may appear in the same situations. It is most important to relieve pressure and at the same time very difficult. I have not found any physiotherapeutic methods helpful. Injection of iodolysin is sometimes followed by disappearance of nodules in other parts, and a trial would be justified. The injections should be made into the gluteal muscles in the vicinity of the nodules, with no attempt to transfix them. After a few injections a long course of the same remedy should be given by mouth, with occasional intervals.

Vitamin B_1 for Neuritis

Q.—*Intensive treatment with vitamin B_1 is recommended for neuritis. Is it possible to do harm by excessive doses? What is the normal and what the maximum dosage?*

A.—It is doubtful if vitamin B_1 therapy is any more effective in the treatment of neuritis than the usual remedies, such as rest and physiotherapy, unless, of course, there is an underlying deficiency of vitamin B_1. It is possible to do harm by excessive doses. There is a delicate equilibrium between the metabolism of the B vitamins, and a massive dose of one has been observed to precipitate symptoms of a deficiency of one or more of the others. This was noted in 1941 by Sydenstricker (*Ann. intern. Med.*, 1941, **14**, 1499) and has been repeatedly confirmed. Large doses of vitamin B_1—e.g., 25 to 75 mg. a day parenterally—are recommended at first, and when the desired relief is obtained, maintenance doses of 3 mg. t.d.s. by mouth are given. Up to 100 mg. can usually be given in a single dose with safety, although in a few susceptible patients toxic effects with such dosage have been reported. If there is no improvement in a few days it is useless to continue treatment. Some source of the other B vitamins, such as brewers' yeast or wheat germ, should be prescribed as well if large doses of vitamin B_1 are given.

Addition of Sodium Citrate to Milk

Q.—*Sodium citrate is much used in treating babies and young infants to reduce the size of milk clots during digestion and in larger dose in urinary conditions. Is there any danger of alkalosis developing? If so, what are the maximum safe doses for (a) short and (b) long-continued treatment?*

A.—Assuming that the baby or young infant is normal, without vomiting or diarrhoea, and that sodium citrate is being added to the milk in the proportion of 1 to 2 grains for every ounce of *whole* milk, then there is no danger of alkalosis. (If the milk is boiled, as it should be, the addition of citrate makes very little further difference to the size of the clot or to digestibility, and is really no longer as useful a method as it was once thought to be.) In the treatment of urinary conditions there is certainly a danger of alkalosis—especially if sickness and diarrhoea are present. The value of alkaline administration in urinary infections lies almost entirely in producing a sudden change from an acid to an alkaline reaction in the urine. For this purpose, the usual adult dose of 30–60 grains of citrate two-hourly until the urine is alkaline, and then four-hourly for another 48 hours, can be adapted to a child's weight: i.e., a 7-lb. newborn baby gets 1/20 of a 10-stone adult's dose; an infant of 6 months gets 1/10 adult dose; and so on. On this short and sharp regime the danger of alkalosis is small.

Long-continued use of alkalis has surely now been replaced by sulphonamide treatment, and the last part of the question does not really arise. If big doses *are* used for more than a few days, the plasma bicarbonate should be estimated. It should be remembered that citrates act precisely as carbonates or bicarbonates in the tissues, and are therefore just as likely to cause alkalosis. Their merit is that they do not neutralize gastric juice and are said, therefore, not to produce as much digestive upset. If free diuresis occurs with citrate therapy, as it should, there is a risk of chloride loss, which predisposes towards alkalosis. Long-continued use of citrates should, therefore, be accompanied by a daily dose of sodium chloride—again based upon an adult dose of 120 to 240 grains daily.

INCOME TAX

Storage of Car during Active Service

R. M. ceased civil practice on joining the Forces. Circumstances have required him to lay up his car (so that it may be available for professional use after demobilization) at a cost of £12 a year. Can he claim any deduction for that expense?

*** The Income Tax Acts do not provide any *general* provision for the allowance of expenses; they proceed by defining certain classes of income liable to tax and then providing for the deduction of expenses in assessing the incomes. Thus deductions are permitted for repairs in the Schedule dealing with income from property, for necessary expenses in Schedule E, for ordinary current expenses in Schedule D, etc. R. M. is in this difficulty—the £12 a year expenditure is not incurred in connexion with any income for *which he is assessed*; it is incurred to keep in stock, so to speak, an asset for use in the future. We are not aware of any provision in the statutes on which he can base a claim to have it treated as a subject for allowance against the tax he suffers on his official pay or on any other income he may have. He has a right of appeal against the assessment of tax on his pay, which he can exercise by giving notice to the War Office Assessor of his wish to do so. But it seems to us hopeless to contend that the £12 in question is expended wholly, exclusively, and necessarily in performance of his duties as an officer in the R.A.M.C., and that is the proposition he would have to substantiate. (In the case quoted by R. M. the owner of the car was continuing to carry on his civil practice.)

LETTERS, NOTES, ETC.

Unilateral Flush after Food

Dr. F. PARKES WEBER (London, W.1) writes: The case so interestingly discussed under the above heading among "Any Questions?" (May 12, p. 687) resembles the "auriculo-temporal syndrome," except for its extreme mildness and for the fact that it is not connected with scarring in the parotid region. In fully developed examples of the auriculo-temporal syndrome the flushing at the side of the face on eating is accompanied by local sweating. The exact mechanism of the autonomic nervous disturbance which causes the remarkable flushing and sweating on eating is not absolutely certain, but apparently in cases like the one under discussion there is some *developmental* peculiarity in the local autonomic nervous apparatus which causes a disturbance similar to, but less severe than, that caused by the parotid scars in true cases of the auriculo-temporal syndrome (F. P. Weber, *Med. Pr.*, 1944, **211**, 199).

Musculospiral Palsy

Mr. A. R. PARKES, F.R.C.S.Ed. (Glasgow) writes: In the issue of April 14 there is a paragraph entitled "Musculospiral Palsy." Surely the answer to the question is that the patient would seem to have had a partial lesion of the *ulnar* nerve, probably a transient physiological block. The symptoms described are far more consistent with interruption of conduction in the ulnar nerve than in the radial. Moreover, it is more common to get pressure on the ulnar nerve (in the forearm) than on the radial when sitting in a deck chair.

*** Our adviser writes: It is true that an ulnar palsy causes semi-flexion of the ring and index fingers, but the patient with an ulnar palsy does not usually complain that these fingers "get in his way," because there is hyperextension at the metacarpo-phalangeal joints. In the case reported the patient also complained that he could not strop his "cut-throat" razor because "he could not turn it over"—i.e., supination of his forearm was also weak. The supinators are supplied by the musculospiral, and only a musculospiral lesion could cause weakness of supination and inability to extend the ring and little fingers.

Portraits of William Harvey

Mr. WILSON STEEL, Sub-Librarian, University of Glasgow, writes: My attention has just been drawn to the article in your issue of Nov. 18, 1944 (p. 669), in which Mr. Geoffrey Keynes deals with the portraits of William Harvey. May I point out, a little late in the day perhaps, two matters of fact upon which Mr. Keynes has gone wrong. Talking of the portrait in the Hunterian Collection in the University of Glasgow he says that the landscape background contains "many buildings, the two most conspicuous of which can be identified as probably the dome of the old College of Physicians and Trajan's Column," and adds that the Roman association has "no particular relevance to Harvey." In point of fact the background of the portrait is simply a view of Rome and not a composite landscape dictated by the artist's fancy. The dome adjacent to Trajan's column is easily identifiable as belonging to the Church of S. Maria di Loreto and not as that of Wren's old College of Physicians, to which it has not the faintest resemblance. In the matter of relevance we learn from the *Dictionary of National Biography* that Harvey visited Rome in 1636 and dined at the English College on Oct. 5 of that year.

Diet and Dental Health

Dr. A. LIVINGSTONE (Southampton) writes: I have read with the greatest interest recent articles in your journal and in others which at first sight "debunk" the value of vitamin C in preventing or curing gingivitis. In *Nature* for June 17, 1944, there is a letter pointing out the essential need for manganese in the diet so that the body may make or utilize (or both) vitamin C. This leads me to observe that, as has so often been pointed out, our grandmothers were right; when their dentures gave them sore mouths they sucked a lump of alum, preferably "iron alum," from the ironmonger's. ("Iron alum"—Potassium ferric sulphate. Pale violet crystals, efflorescent in dry air. *Practical Chemistry*, Bruce and Harper, London, 1911.) These alums probably contained traces of manganese as an impurity (*Pharmacopeia*, White and Humphrey, London, 1909). Ingestion may have enabled the old ladies' digestive tract, especially in the region of the jejunum, to make or utilize vitamin C; the sore mouth was really subliminal scurvy. Further, there appears now to be a distinct cycle of events. Boils and "colds on the lip" are, certainly in this neighbourhood, becoming very frequent. The shortage of fruit and consequently of vitamin C, the shortage of potassium and manganese in crops grown on soil old and tired and certainly short of these elements, are leading to a sugar intolerance, the pancreas being disturbed through lack of vitamin C. Tooth structure is affected as shown by caries rapida. No attention appears to have been paid to the tooth pastes used by the Forces. Some considerable clinical experience, borne out by others of my profession, shows that the tooth pastes containing "ricinoleate" in very many cases profoundly irritate the gum margins: in many cases they appear to cause an allergy. I have been informed by a senior officer of the W.R.N.S. that the only tooth paste that was available in the nearest canteen for some time contained "ricinoleate," and practically every one of the girls had inflamed and bleeding gums, which did not respond to treatment with vitamin C. There is also a clinical slow deterioration in the normal condition of the gums after the long-continued use of tooth pastes containing borates and perborates. I understand that boric acid inhibits the growth of cells and tissues, and it is forbidden to add it as a preservative to foodstuffs. In tooth pastes it appears to lead to failure to replace the epithelium of the gums, which become excessively thin and bleed on the slightest touch; even chewing food will cause haemorrhage, as in serious cases where "ricinoleates" are used. Would it not be possible for the Ministry of Health to issue a formula for common table salt containing a sufficient supplement of the trace elements? Lastly, the following is a formula for a tooth powder which gives traces of potassium if not rinsed away after the surplus has been spat out: sod. bicarb. ʒij; calc. carb. praecip. ʒij, pot. chlorate ʒij, sod. chloride ʒij, ol. limonis ♏ x. I am much obliged to Mr. Graham Clift for helping to run the "iron alum" to earth.

A Prolonged Case of Pulmonary Tuberculosis

Dr. JOHN J. LAWS writes: Pulmonary tuberculosis is notoriously variable in its course. While many cases terminate fatally after a longer or shorter period, others are more chronic; and still others heal with fibrosis, leaving scars still visible at necropsy many years after. Even the most chronic cases, however, tend to go one way or the other in course of time, so that it may be of interest to give some account of a case in which the disease still showed mild activity when the patient died of senile changes at 90, it having been present for at least 24 years, and probably more than twice that time. The patient entered a mental hospital at the age of 66, suffering from persecutory delusions. These did not markedly affect his general conduct, and he was able to lead a fairly reasonable institution life, often in parole villas. He had—on admission—a history of having had treatment for pulmonary tuberculosis in different hospitals for many years. One of his chief symptoms had been intermittent haemorrhages—the first 30 years before. So that one can probably assume an age of onset somewhere between 35 and 40. His story after admission was very similar to that before: occasional bouts of cough and pyrexia, and haemoptyses at irregular intervals. These, though never very copious, were usually severe enough to warrant a period of rest in bed. Physical examination revealed signs of a chronic right-sided lung lesion. At no time were tubercle bacilli found in his sputum, though search was frequently made. *X*-ray examinations during his 16th and 22nd years in hospital confirmed in general the physical findings—"Fibroid tubercle both apices—especially right." At post-mortem there was a small area of fibrosis at the right apex containing several small cavities—none larger than a small bean. At the base of the right middle lobe there was a slightly more active lesion—one or two cavities filled with stiff caseous material. A further small fibroid lesion was present at the left apex. No other tuberculous lesions were found; but the heart and kidneys showed marked arteriosclerotic changes, the latter especially being very shrunken and contracted. Microscopical examination of sections from the most active-looking pulmonary lesions showed a typical tuberculous reaction, with giant cells and scattered acid-fast bacilli. I wish to thank Dr. F. G. L. Barnes, medical superintendent of Long Grove Hospital, Epsom, for permission to publish this case.

Epilepsy and Menstruation

Surg. Cmdr. H. LOVELL HOFFMAN, R.N.V.R., writes: I note that the induction of an artificial menopause in so-called "menstrual epilepsy" was recently mentioned in the *Journal* ("Any Questions?" March 17, p. 396). I have no detailed notes, but I remember one of my patients who was so treated. This woman assured me that she never experienced fits except in association with menstruation. She had always been free of attacks during her pregnancies. As she was aged about 34 and had several children it was decided, after consultation with a gynaecologist, that the production of an artificial menopause was justified and this was carried out with radium. The periods stopped and so did the fits, the patient being delighted with the result. Some months later she informed me that she had had but one slight seizure while mildly intoxicated at Christmas! The menopause was not permanent, and both periods and fits gradually returned. As I left the hospital shortly afterwards I unfortunately lost touch with the patient. In many women fits occur more often just before or just after menstruation, but there are also attacks at other times. It is rare to see a case, such as that quoted, in which fits occur only in association with the periods. If the relationship is less definite or other obvious factors, such as age and number of children, are not so favourable, I doubt if this method of treatment is justified.